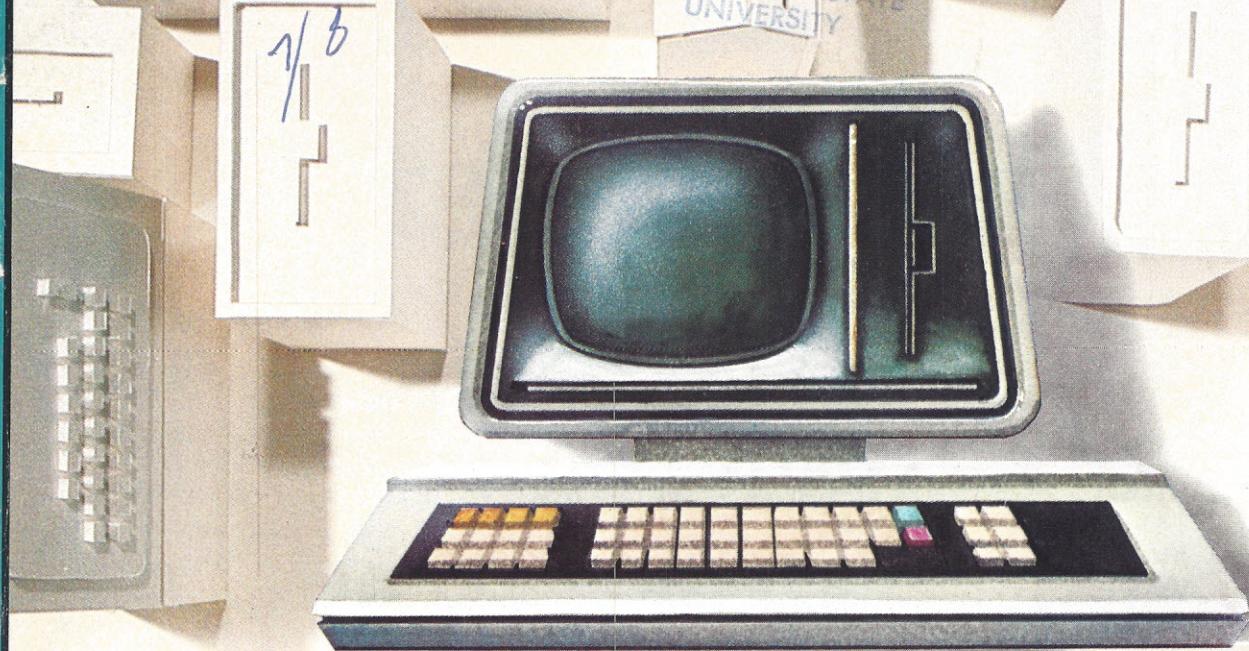


COMPUTING FOR BUSINESS

INTERFACE AGE

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Business Systems Comparison



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Teletek

SBC-I SYSTEMASTER®

The Next Logical Step

Teletek FDC-I, The First Step

A CPU, floppy disc controller and I/O all on one board.

Until SYSTEMASTER® the most powerful IEEE-S-100 board on the market.

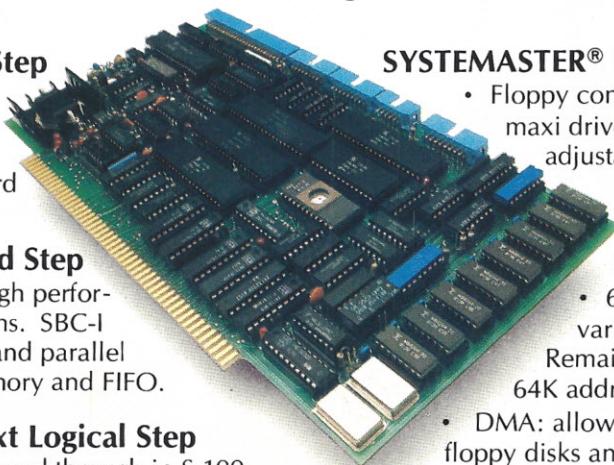
Teletek SBC-I, The Second Step

A board designed for use in high performance, multiprocessing systems. SBC-I combines its own CPU, serial and parallel ports, 128K of segmented memory and FIFO.

SYSTEMASTER®, The Next Logical Step

Teletek's newest product — a breakthrough in S-100 board design. SYSTEMASTER® is a complete system. No other boards are required. It doesn't even require a bus!

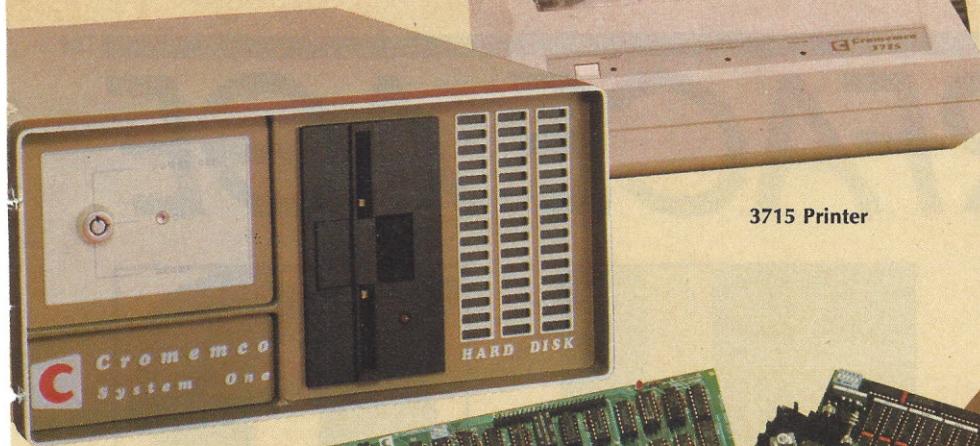
But, when used with an S-100 bus, SYSTEMASTER® has even more capabilities. You can readily expand to multi-user or multi-processor systems using SYSTEMASTER® as the master board.



SYSTEMASTER® Features:

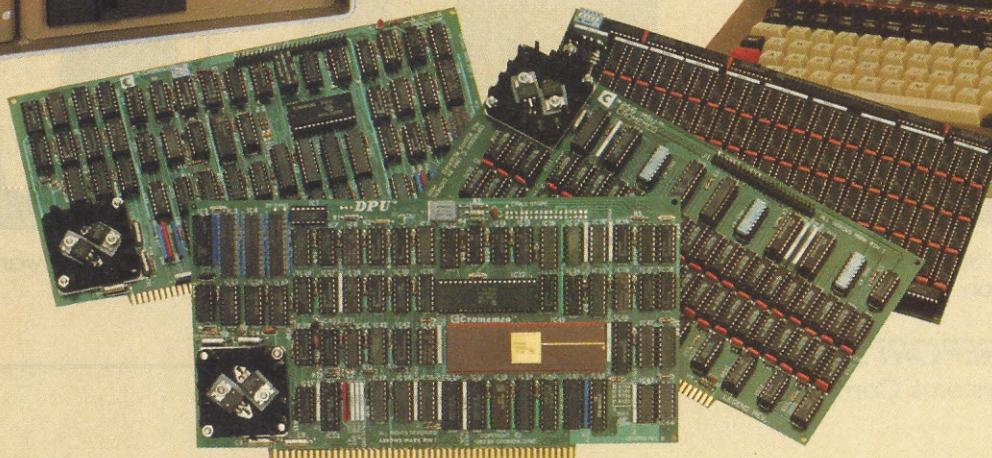
- Floppy controller: controls mini and/or maxi drives; variable independently-adjustable pre-write compensation.
- CPU: 4MHz Z80A
- Two RS-232C ports.
- Two full parallel ports.
- 64K bank-selectable memory variable from 32K to 60K.
Remaining memory is fixed at top of 64K address space.
- DMA: allows transparent data transfer to floppy disks and other devices without CPU wait states.
- Relocatable EPROM/ROM/PROM: 2K, 4K or 8K with deselect capability.
- Real-time clock.
- Operating systems available: Digital Research or Turbodos.
- Parallel ports may be connected to Teletek's PSC board for RS-422 capability.

TELETEK



System One CS-1H

3715 Printer



DPU card with error-correcting memory and controller cards

3102 Terminal

POWERFUL NEW MICRO. POWERFUL SOFTWARE.

68000-POWERED FOR TOMORROW

Once again you get a big stride forward with Cromemco.

This time it's our new DPU Dual Processor Unit. It gives enormous power to Cromemco computer systems such as our System One shown here.

COMPARES WITH MAINFRAMES

With the new DPU you get the almost unbelievably powerful 68000 processor and its 32-bit data-handling capabilities combined with its **16 Megabyte** address space.

In other words with the System One/DPU combination you get a small machine that's the equal of superminis and mainframes in some areas.

8-BIT AND 68000 SOFTWARE

The dual part of the DPU refers to its on-board Z-80A processor. With this you have access to existing CP/M* software.

But besides being compatible with this wealth of existing 8-bit software, the System One/DPU has available a whole family of new 68000 system software. This includes a wide range of high-level

software such as our 68000 Assembler, FORTRAN 77, Pascal, BASIC, COBOL, and C.

Beyond all this there's a version for the 68000 of our widely admired CROMIX† Operating System. It's like UNIX‡ but has even more features and gives multi-tasking and multi-user capability. In fact, one or more users can run on the Z-80A processor while others are running on the 68000. Switching between the Z-80A and 68000 is automatically controlled.

The System One itself is a bus-oriented machine that has options for color graphics, for 390K or 780K of floppy storage, a 5 MB hard disk option, communications capability, and multi-processor capability using our I/O processor card.

HIGHLY EXPANDABLE

With the System One/DPU combination, you get tremendous expandability. Right now you can have up to 2 MB of RAM storage. You get this with our new Memory Storage cards and our Memory Controller. The Controller fully supports the 16 MB storage space of the 68000,

allowing you vast future expansion capability.

Further, the memory has built-in **error detection** and **correction**, a feature normally found only in much more costly systems.

Present customers can field-upgrade their Cromemco systems to use the DPU and still be able to run their present software using the Z-80A on the DPU. It's one more instance of Cromemco's policy of providing obsolescence insurance for Cromemco users.

LOW PRICED

With all this performance you might not be ready for the low price we're talking about. With 256K of RAM and 780K of floppy storage, the price of the System One/DPU is only \$5495. Yes, that's hard to beat.

So contact your rep now. He'll fill you in on the many more features that this outstanding and powerful machine offers.

*CP/M is a trademark of Digital Research

†CROMIX is a trademark of Cromemco, Inc.

‡UNIX is a trademark of Bell Telephone Laboratories



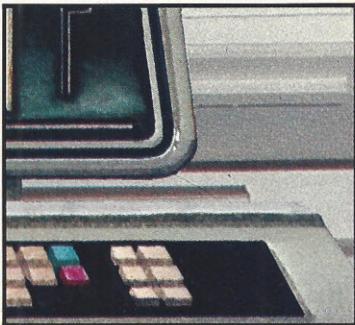
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Hardware Systems Comparison 78



Introducing
Alpha Micro AM-1000 72



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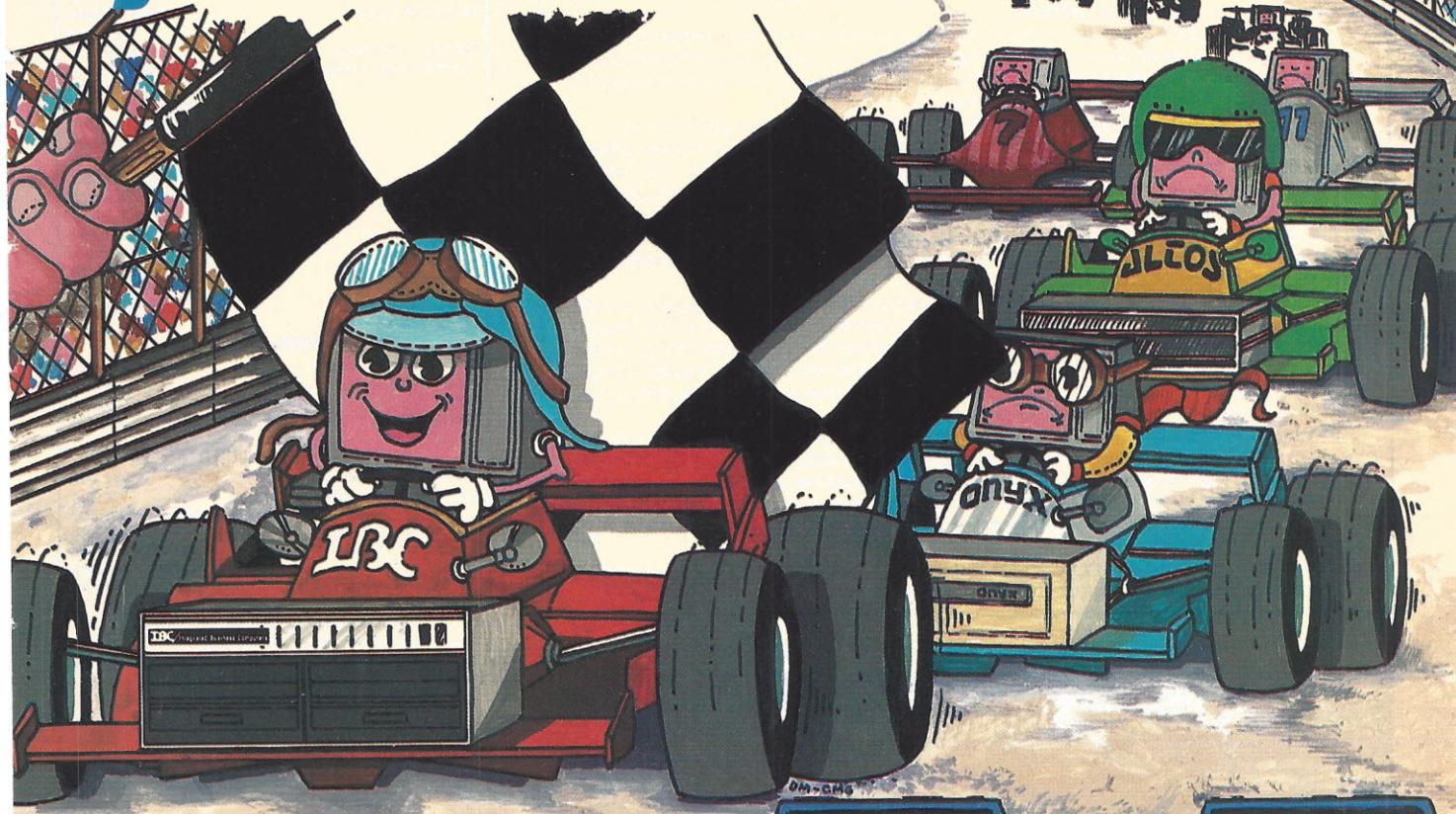
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INTERFACE AGE Magazine, published monthly by McPheters, Wolfe & Jones, 16704 Marquardt Ave., Cerritos, CA 90701. Subscription rates: U.S. \$21.00, Canada \$27.00, all other countries \$35.00. Make checks payable in U.S. funds drawn on a U.S. bank. Opinions expressed in by-lined articles do not necessarily reflect the opinion of this magazine or the publisher. Mention of products by trade name in editorial material or advertisements contained herein in no way constitutes endorsement of the product or products by this magazine or the publisher. Circulation Department, (213) 926-9540.

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INTERFACE AGE Magazine is catalogued in the Library of Congress, Classification No. QA75.5.155, USPS No. 580-310. ISSN Publication No. 0147-2992.
POSTMASTER: Please send change of address form 3579 and undelivered copies to **INTERFACE AGE** Magazine, 16704 Marquardt Ave., Cerritos, CA 90701. Second class postage paid at Lincoln, Nebraska and Artesia, California.

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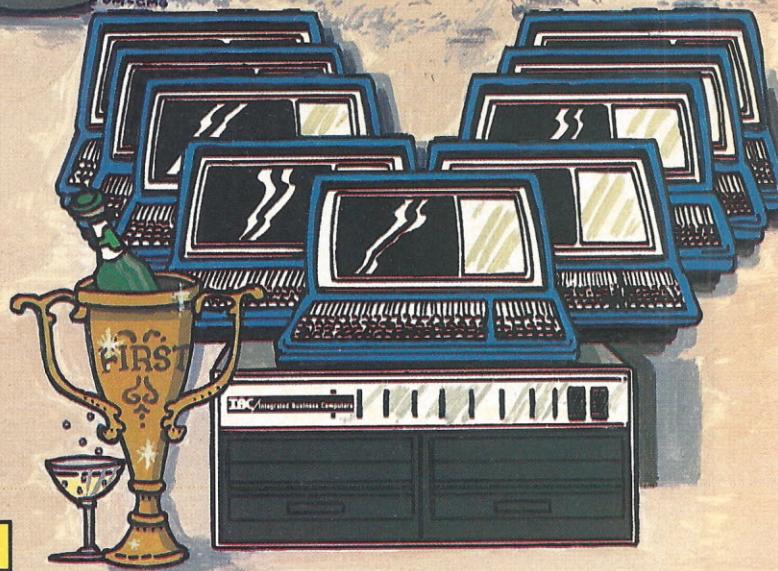


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ARTICLES WANTED

The editorial department at INTERFACE AGE is always happy to review unsolicited articles to consider for publication. The following guidelines on preparing submittals will afford authors the best opportunity possible to receive placement in the magazine.

Our primary focus is on microcomputer applications for businesses. Unique and unusual methods wherein various businesses can obtain efficient use of their systems are of interest. The fields of law, medicine, education, retail sales, accounting and record keeping, filing and all manner of useful office functions are emphasized. Case studies of how particular businesses computerized their operations are encouraged. Step-by-step procedures, including planning, product selection and implementation should be detailed.

Our agenda calls for articles on such topics as computer art and graphics, word processing, end-user options in purchasing a computer, computerized communications and networking, the future of computers, and business hardware/software in various capabilities and price categories.

To a lesser extent, we also publish tutorials, utility and language features.

Good quality program listings, accompanied by articles explaining the programs, are sure bets for serious consideration during our screening process. The listings should be no more than 60 characters wide, with no wrap-around lines. Unlined paper and a new ribbon should be used. Sample runs should also be included. In the article, variables should be described. The system utilized in composing the program should be detailed—operating systems, language type and version, and any necessary peripherals.

Submittals should be prefaced by a brief synopsis of the article. Manuscripts should be typed or printed out double-spaced with one-inch margins. Minimum text length is eight pages, whether or not the article is accompanied by a program listing. Photos should be numbered and have a brief description attached to each. Tables, listings, etc. should be on separate pages and each should have a caption. Authors must submit a statement of background and expertise.

The publisher assumes no responsibility for artwork, photos, or manuscripts. No acknowledgement is made unless the submission is accompanied by a large, stamped return envelope. A minimum of six weeks should be allowed for a response; it is requested that authors do not phone for information about submittals.

The submittals should be addressed to: Editorial Department, Interface Age Magazine, 16704 Marquardt Ave., Cerritos, CA 90701.

One final note: Articles intended for a particular month should be in our office no later than four months prior to the cover date.

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International/Domestic Retail Circulation

(213) 926-9544
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Seymour Press Limited
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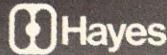
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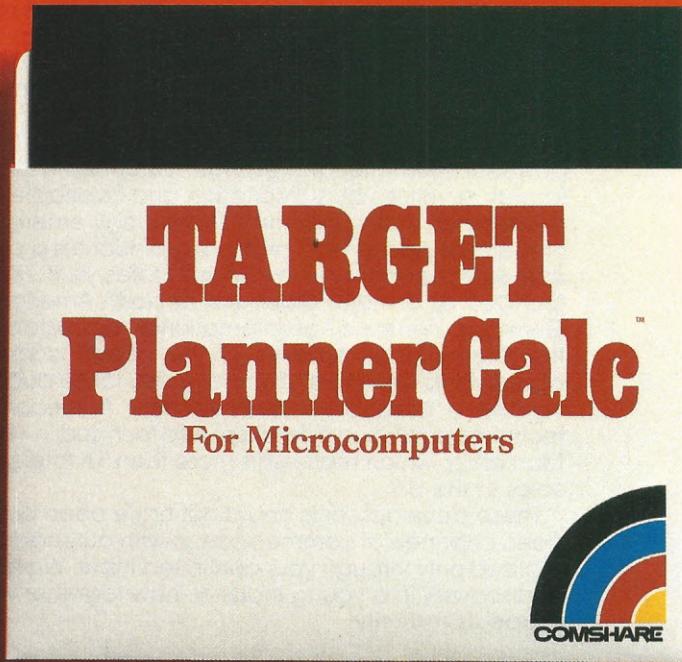
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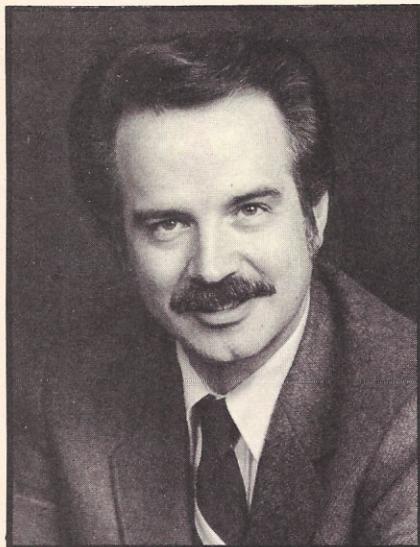
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CIRCLE INQUIRY NO. 17

OPINION



Robert S. Jones
Publisher

No longer are silicon chips the exclusive toys of scientifically-adept hobbyists. Now that the general public is becoming involved with microcomputers, information on the subject must adapt to the customer—not the other way around. In the early days of the industry, there was comparatively little competition—most of the industry's periodical literature was mediocre. It was awkwardly assembled and seldom accessible to the non-technical layperson.

Nowadays, people with no previous exposure to computers are discovering the need to better understand them. During the seven years that have spawned *Interface Age*'s present maturity, we have become aware of the increasingly specialized needs of our primary audience—the businessman.

There are over 13,000,000 small businesses in the United States that will use or are currently using a small computer in their operations. These people have come to rely on our publication to help them derive optimum benefit from the new world of automation. Over the last several years, our readership has grown particularly attuned to business implementation. Throughout this evolutionary period, the magazine has recognized the more discerning market through refined editorial content and more formalized graphic continuity.

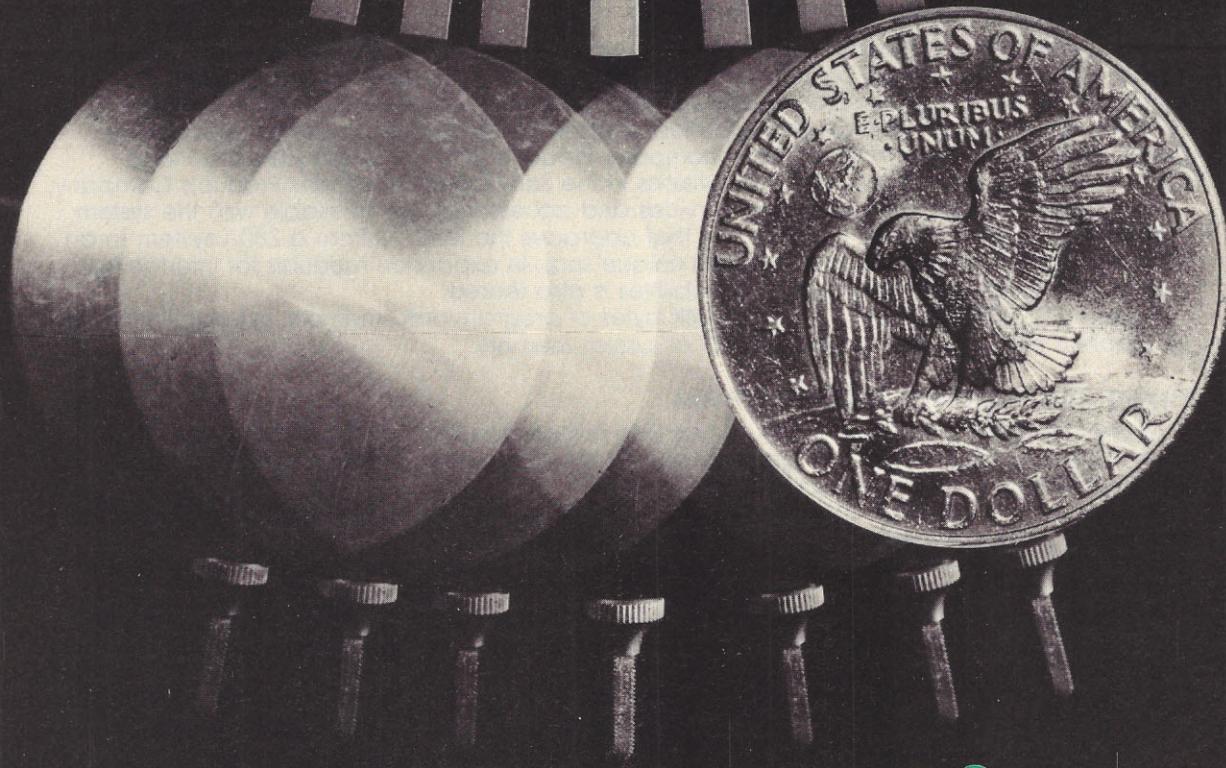
This issue marks the culmination of our labors as a truly dedicated business computer publication. It's much more than just an aesthetic change; *Interface Age* has assumed a more disciplined approach. While we have always strived for quality writing standards, editorial content is just one aspect of presenting understandable information. Many elements need to be coordinated, including layout and production. I have heard communication specialists observe that technical writing is not unlike writing code for a computer program. If the planning and structure are sound, the prose evolves naturally. With this premier issue, we submit an intensified effort toward formal design, the primary objective of which is useability. We are confident you will find the product to be an invaluable addition to your library of microcomputer information.

As *Interface Age*'s circulation passes over 300,000 by the middle of the 1983 fiscal year, we anticipate comparison with other leading journals. In contrast to most, we have grown naturally. Some leading publishers have resorted to the inflated-numbers game to induce rapid growth and win recognition. Conversely, we have avoided mass market blitzes, million dollar mass mailings and subscription discounting. Without regard for self-gratification, *Interface Age* has concentrated on serving its loyal readers. Our audience grows daily, as more people recognize this commitment to editorial integrity.

In addition to unmatched domestic growth, *Interface Age* has enjoyed powerful international presence. It is currently distributed to more than 106 foreign countries by subscription and available on three dozen countries' newsstands. Data Dynamics Technology emerged as a separate division of *Interface Age* in 1977 and today distributes a peerless library of over 1,000 computer book titles in the United States. In 1978, *Interface Age Verlag* was founded as a major distributor of North American computer book titles in Germany. *Interface Age International, Inc.*, established in 1980, coordinates the international activities of the parent company—providing licensing agreements and translations for many large publishers in the U.S. Today this venture is recognized as a primary American- and German-language technical publishing operation. Also founded in 1980 was *International Media Marketing*, which represents more than 16 foreign publishers for advertising sales in the U.S.

These developments could not have been possible without maintaining open channels of communication with our readers. Further progress will be realized only through your continued input. We have shared a dynamic era of discovery in a young industry; now together we have the opportunity to shape its maturity.

A handwritten signature in black ink, appearing to read "R.S. Jones".



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MILESTONE requires 56K RAM and CP/M. Also available for CP/M-86 and UCSD Pascal. Specify 8080, Z80, 8086, UCSD Pascal. Formats: 8" single density IBM soft-sectored, 5 1/4" NorthStar DD, Micropolis Model, Superbrain 3.0, Apple II with CP/M, 5 1/4" and 8" Xerox 820, IBM Personal Computer with CP/M-86, IBM Display Writer with CP/M-86.

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UPDATE

Sony introduces business microcomputer

Sony Corporation of America (New York, NY) has introduced a desktop microcomputer known as the SMC-70. The unit will be sold by a national network of dealers, including specialty computer stores and selected Sony office products and video products dealers. Marketing, software development, service and technical support for dealers and systems users will be provided by Sony's newly-formed Microcomputer Products Division, which joins the Video Communications and Office Products Divisions in the Sony Communications Products Company.

There are a full range of peripheral services and accessories available with the system, including an optional 16-bit adaptor unit that upgrades the SMC-70 from a Z80A system to an 8086 system. A slide-out tray that accepts unique snap-in expansion modules for interfacing accessories or for extending system capabilities is also featured.

Priced at \$1,475, the basic unit offers 64K bytes of program/data memory, an additional 38K of graphics memory and a separate 32K of system memory.

Apple and Franklin in legal brouhaha

Apple Computer Inc. (Cupertino, CA) has filed suit against Franklin Computer Corp. (Pennsauken, NJ) for patent infringement, copyright infringement, unfair competition and misappropriation. Franklin has countersued.

Apple's lawsuit, filed in the U.S. District Court of Eastern Pennsylvania, charges Franklin with copying Apple's computer programs and components.

Apple is seeking preliminary and permanent injunctions against the manufacture or sale of Franklin's products, in addition to the profits, if any, from Franklin's sales.

According to Apple, Franklin has produced a computer known as the Ace 100, which can run all programs available for the Apple II at a small fraction of the investment made by Apple in developing the Apple II and its software.

Franklin, says Apple, has substantially copied the main printed circuit board and components of the Apple II, incorporating features covered by patents issued to Apple in 1979 and 1981.

In counterclaims, Franklin asserts that the contested patents and copyrights are invalid. Franklin further alleges that Apple has engaged in anticompetitive and predatory practices in violation of the Sherman antitrust act.

Sinclair to be sold by Timex

Sinclair Research (Boston, MA) has licensed exclusive North American marketing rights to Timex Corp. (Waterbury, CT) to sell Sinclair technology—including the popular ZX81 system. A refurbished computer called the Timex Sinclair 1000 will replace that unit. It is alleged to feature an additional 1K byte of RAM and will sell for about \$100. No kit will be available and the new package will be widely available in common retail stores. Unlike the preceding model, it will not be available by mail order.

Peachtree revamps image and expands product line

Peachtree Software Inc. (Atlanta, GA), a subsidiary of Management Science America (MSA), has launched major changes in its corporate identity, software packaging and marketing programs.

The big-buck campaign includes heavily-redesigned product packaging, adoption of a new logo, renaming of several programs, introduction of a revised sales and distribution plan, increased rate of software acquisition, and the opening of a West Coast office.

These new directions are evidenced in the following examples. Magic Wand word processing package was christened PeachText. It becomes part of the PeachPak 9 Office Productivity Series, which also includes Spelling Proofreader (formerly Magic Spell), the PeachCalc electronic spreadsheet (formerly MagiCalc), Telecommunications (formerly Magic Messenger) and Mailing List Merger (formerly Magic Address).

In addition to issuing distribution licenses to Wang, Osborne and Hewlett Packard for selected programs, Peachtree has acquired the rights to market computerized versions of the Random House Dictionary, Black's Law Dictionary, Stedman's Medical Dictionary and the Random House Thesaurus. The company also obtained rights to Compacct, a series of European Cobol accounting packages that run under CP/M and MP/M.

Hewlett-Packard announces enhancements

At press time, Hewlett-Packard (Corvallis, OR) announced an enhanced version of its HP-87 system (reviewed in this issue on page 94).

The HP-87 (for "extra memory") includes a built-in 128K bytes of RAM, with expansion capabilities. With a 48K-byte ROM operating system and 16K bytes of display control, the system has a maximum of 704K bytes.

Software for the entire HP Series 80 line is compatible with the HP-87XM.

Price is \$2,995, slightly higher than the HP-87's basic tag of \$2,495.

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PRODUCT HIGHLIGHT

DEC Unveils Long-Anticipated Personal Computers

Following a two-year development effort, a series of personal computers with advanced hardware features and broad software capabilities will be available from Digital Equipment Corp. (DEC, Maynard, MA) this fall.

The series includes three modular systems that support a range of activities from off-the-shelf applications to sophisticated word processing, video color graphics, multiple task management and communications.

The microcomputers, each with black-and-white video display monitor, keyboard, and system box containing the central processor, main memory and disk unit, range in basic price from under \$3,500 to \$5,000. They include the Professional series: two models, the Professional 350 and the Professional 325, which feature the PDP-11/23 CPU chip, 256K bytes of memory, and a multitasking operating system; the DECmate II, with the power of the DECmate Work Processor system, and an optional CP/M capability; and Rainbow 100, that runs both 8-bit and 16-bit CP/M 86/80 application programs, and can use other operating systems, such as MS-DOS.

Each is equipped with a low-profile, 103-key keyboard; a 12-in. monochrome video display monitor; and a system box, containing the processor, power supply, and disk storage, that can be placed on any work surface or in an optional floor-standing enclosure. The standard disk unit is a dual 5½-in. floppy disk drive with 800,000 bytes of storage space. The Professional 350 system unit has space for adding a 5½-in. Winchester-type disk drive with five million bytes of data and program storage.

The units all measure 19¼-in. wide by 14½-in. deep by 6½-in. high. The Professional 350 system, housing a 5M-byte Winchester disk drive, is four inches wider. The 12-in. monochrome monitor can be tilted through a 30-degree range.

Price for the Rainbow 100 system, with 64K bytes of RAM and the CP/M 86/80 operating system, is \$3,795. The Professional 325, with a memory complement of 256K bytes and Professional Operating System (P/OS), begins at \$3,995. The top-of-the-line Professional 350, with a larger system box and power supply for expansion, is priced at \$4,995.

A selection of tabletop printers for Digital's personal computers include the LA50 dot-matrix printer, the multispeed, variable-font Letterprinter 100, and the LQP02 letter-quality printer. Other options are a second dual mini-floppy disk drive, for a total removable disk capacity of 1.6M bytes, and a 13-in. high-resolution color monitor. Internal memory for the Rainbow 100 can be increased to 256K bytes.

Further options for the Professional 300 series consist of a mathematical floating point adapter, a real-time interface for data acquisition, and extended bit-map graphics capability. It also accepts the optional 5M-byte Winchester disk and accommodates a Telephone Management System (TMS), which can automatically place, receive, and digitally record telephone calls.

Many systems and application software packages are available for use with the Digital product line. Operating systems range from CP/M 86/80, for the Rainbow 100 system, to the P/OS multitasking system for the 300 series. Application software includes text and document transfer packages, spreadsheet calculator and business accounting software for Rainbow 100, and word processing and business management application packages for DECmate II. Digital has also entered 22 relationships with independent vendors for conversion of 75 application packages for this series.

Digital's Personal Computers at a Glance

System	RAINBOW 100	DECmate 100	Professional 325	Professional 350
processor(s)	Z80 and 8088	6120 (PDP-8+)	F-11 (PDP-11/23)	F-11 (PDP-11/23)
maximum memory	256 Mbytes	64 Kwords (96 Kbytes)	256 Kbytes	256 Kbytes
operating system	CP/M 80/86	COS 310 & WPS-8 (word processing)	P/OS	P/OS
CP/M capability	Standard (80/86)	optional (80)	to be announced	to be announced
video monitor	12-in monochrome	12-in monochrome	12-in monochrome	12-in monochrome
video control	character cell graphics option	character cell	bit map; integral graphics—color control optional	bit map; integral graphics—color control optional
display	24 lines by 80/132 columns	24 lines by 80/132 columns	24 lines by 80/132 columns	24 lines by 80/132 columns
color video monitor	optional	none	optional	optional
floppy storage	5.25-in 400 Mbyte double density dual drive	5.25-in 400 Mbyte double density dual drive	5.25-in 400 Mbyte double density dual drive	5.25-in 400 Mbyte double density dual drive
Winchester storage	5.25-in. 5-Mbyte optional (external)	5.25-in. 5-Mbyte optional (external)	none	5.25-in. 5-Mbyte internal option
price (with O/S)	\$3,495	\$3,745	\$3,995	\$4,995
printers supported	LA50, LQP02, Letterprinter 100	LA50, LQP02, Letterprinter 100	LA50, LQP02, Letterprinter	LA50, LQP02, Letterprinter 100
printer port	RS-232	RS-232	RS-232	RS-232
telephone management system	no	no	to be announced	yes
VT102 emulation	yes	yes	yes	yes
VT125 emulation	optional	no	optional	optional
memory option	yes	no	no	no
misc. options	extended capabilities graphics	none	floating point extended bit map color control	floating point extended bit map color control
third-party system software	MS-DOS "C" Compiler	CP/M 80	UCSD-P Pascal compiler	UCSD-P Pascal compiler



The DEC Professional 325 features dual 5½-in. floppy disks, 12-in. diagonal bit map graphics display and dot-matrix printer.

CB80

Ultra *FAST BASIC* Compiler

CB80™ Compiler System's new native code Basic compiler, offers maximum speed and flexibility in creating applications to solve today's business problems.

CBASIC™ compatible: As an addition to the CBASIC family, CB80 has all the features of CBASIC (14 digit accuracy, long variable names, stream and record I/O, multiple line functions) plus these extras:

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Expand your versatility. CB80 includes our LK80™ linker. It allows you to create programs in separate modules and easily combine them. Powerful CHAINING capabilities, multiple library scanning, and easy linkage to assembly routines, are all part of LK80.

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you can see a difference.**



Stop in a store near you. Take a look. You'll be instantly taken with some of the features that make the IBM Personal Computer so different.

Like the non-glare screen—easy on the eyes during those number-crunching tasks like payroll and general ledger.

80 characters a line—with upper and lower case letters for a quick and easy read.

And the flexibility of a system that lets *you* move the components around at will. (To get really comfortable, try the keyboard on your lap and put your feet up.)

Go ahead, compare.

As you progress from casual observer to comparison shopper, you'll want the inside story of the IBM Personal Computer.

Like user memory expandable up to 256KB. And 40KB of permanent memory. (Which not only includes the BASIC language, but diagnostic instructions that automatically check the system every time you turn it on.)

A 16-bit microprocessor that can improve speed and productivity.

A mix of crisp text and high-resolution color graphics on your own TV set—clearly helpful for creating charts to target forecasts and trends.

Or the 10 programmable function keys that let you bid goodbye to the tedium of repetitious tasks.

And the list goes on. Which is why we've included a box (at right) that tells all.

There's more than meets the eye.

Some of the best things about the IBM Personal Computer aren't part of the computer.

Like the instruction manuals that help you set up your system and teach you to use it with the greatest of ease.

IBM PERSONAL COMPUTER SPECIFICATIONS

User Memory	Display Screen	Permanent Memory
16K-256K bytes*	High-resolution*	(ROM) 40K bytes*
Microprocessor	80 characters x 25 lines	Color/Graphics
16-bit, 8088*	Upper and lower case	<i>Text mode:</i>
Auxiliary Memory	Green phosphor screen*	16 colors*
2 optional internal diskette drives, 5 1/4", 160K bytes or 320K bytes per diskette	Operating Systems	256 characters and symbols in ROM*
	DOS, UCSD p-System, CP/M-86†	Graphics mode:
Keyboard	Languages	4-color resolution: 320h x 200v*
83 keys, 6 ft. cord attaches to system unit*	BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL	Black & white resolution: 640h x 200v*
10 function keys*	Printer	Simultaneous graphics & text capability*
10-key numeric pad	Bidirectional*	Communications
Tactile feedback*	80 characters/second	RS-232-C interface
Diagnostics	12 character styles, up to 132 characters/line*	Asynchronous (start/stop) protocol
Power-on self testing*	9 x 9 character matrix*	Up to 9600 bits per second
Parity checking*		

*ADVANCED FEATURES FOR PERSONAL COMPUTERS

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Programs for business. Education. The lab and the home. Programs that make the IBM Personal Computer *your* tool for modern times.

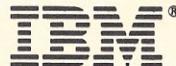
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The quality, power and performance of the IBM Personal Computer are what you'd expect from IBM. The price isn't.

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Visit an authorized IBM Personal Computer dealer. For a store near you, (or for information from IBM about quantity purchases) call (800) 447-4700.

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CIRCLE INQUIRY NO. 38

The IBM Personal Computer A tool for modern times

ZX81



Introducing the Sinclair ZX81.

If you're ever going to buy a personal computer, now is the time to do it.

The Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only \$99.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers.

The ZX81 is a major advance over the original Sinclair ZX80 – the first personal computer to break the price barrier at \$200.

In fact, the ZX81's 8K extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics

THE \$99.95 PERSONAL COMPUTER.

- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
 - Automatic syntax error detection and easy editing
 - Randomize function

useful for both games and serious applications

- Built-in interface for ZX printer
- 1K of memory expandable to 16K
- A comprehensive programming guide and operating manual

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. It comes with a comprehensive programming guide and operating manual designed for both beginners and experienced computer users. And you can use a regular cassette recorder to store and recall programs by name.

Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

Order at no risk.**

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

Introducing the ZX81 kit.

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just \$79.95.* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

A leader in microelectronics.

The ZX81 represents the latest technology in microelectronics. More than 10,000 are sold every week. In fact, the ZX81 is the fastest selling personal computer in the world.

We urge you to place your order for the ZX81 today.

To order.

To order, simply call toll free. Or use the coupon below. Remember, you can try it for 10 days at no risk.** The sooner you order, the sooner you can start enjoying your own computer.

Call toll free 800-543-3000.

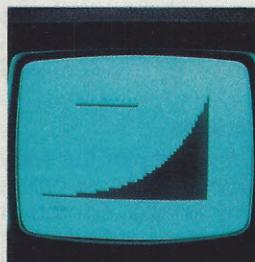
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These numbers are for orders only. If you just want information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

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ZX81	\$99.95			
ZX81 Kit	79.95			
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LETTERS

Up-to-date in Kansas

After reading Louis E. Frenzel, Jr.'s column ("Learning with Micros," /A Apr 82), I think he owes the teachers in small Kansas towns an apology. The implication that the people in Kansas don't even have awareness enough to know the names of the two most popular brands of microcomputers and would recognize only an industry giant is an example of his ignorance—not ours.

In fact, some small Kansas cities are far beyond Apple, Radio Shack, and the IBM PC computers. Fort Scott, KS (pop. 8,300), Pittsburg, KS (pop. 19,000), and Parsons, KS (pop. 12,000) all have multi-user hard disk systems in their high schools. And yes, we even know about superior brands such as Cromemco. Fairfield High School, located in Langdon, KS (pop. 128) has a multi-user Z-2D.

Max D. Armstrong
Fort Scott, KS

Computers for retail

I especially enjoyed Terry Benson's article "The Retail Market Goes Computer" (/A Apr 82). I am an accountant who would like to start a computer service company that would center around cassette tape input transmitted via modem from small stores to a central computer for inventory, A/P, A/R, payroll, etc. I am undecided as to what hardware configuration to offer my customers. I need the cash register/cassette, CRT/cassette, modem and central computer (not yet purchased) to all speak the same electronic language—maybe an overall system geared around the NCR cash register. Can you give me some advice as to where to start?

Kirby L. Jones
Houston, TX

The problem with trying to standardize interfaces between systems is not limited to hardware. There is a corresponding software interface that needs to be considered. The generally accepted standard hardware interface for just about any peripheral is the RS-232 serial communication scheme. There are not yet any standards for the software, but there are a few new software packages to support computer networking that should be appropriate.

I suggest using modems and networking software to transfer the information—not cassettes. The commu-

nication by telephone is more immediate and probably just as reliable. I recommend mini-floppies as local backup instead of cassettes, since there is more support for floppies from both the hardware and software standpoints.

—TB

Praise for pockets

I purchased my copy of the May issue and was happy to see an article written about my pocket computer (Casio FX-702P). Your article was extremely informative, as you pointed out things that I never knew could be done on the little wonder.

Mitchel Lapenson,
Philadelphia, PA

I was very impressed with your May issue. I enjoyed the many system reviews. I particularly enjoyed your review of the Casio pocket computer and thought the features and timing comparisons were excellent. Since I own a Radio Shack pocket computer, I was able to verify the run times, which were quite accurate. This type of review is rarely written, probably due to the fear of lost advertisement revenue. However, it provides a definite service to your readers. I hope you will have the same type of reviews of some of the newer pocket and handheld units, coming out now, such as the Sharp 1500 and Panasonic. I believe that these types of units are the "wave of the future."

Blair Beatty
Placentia, CA

A review of the Sharp 1500 (Radio Shack PC-2) appears in this month's "Portables" column. Watch for a review of the Panasonic unit in an upcoming column.

—ed.

Spelling program update

With the increasing interest and availability of spelling check programs, I found Dona Z. Meilach's feature "Spelling Programs" (/A May 81) most informative. I was disappointed that you were unable to include Spellstar because of the problem that the article mentioned.

Two questions came to mind after reviewing your article. First is in reference to the reason why Spellstar was excluded from your published test results. Is the problem you had common to those versions that have already been purchased by Spell-

star users? If so, is the fix a patch or replacement?

My second question relates to spelling checkers of the future. I would think that because of speed limitations, it is not feasible to have an editor that makes the spelling check at time of entry. It would seem that with a hard disk system and an extensive master dictionary, this is still too much to demand.

When might we enter the world of "real-time" word processing? When I spell "wromg" for wrong, it would be so nice to have my terminal bell ring and immediately see "wromg" in reverse video.

Gary A. Smith
Westchester, OH

The new column "Word Processing," debuting in this issue, should be of interest to you.

The 1.0 version of Spellstar that I was unable to get through my system was returned to Micropo upon request. The company offered to update my version with the new version "when available" as "bugs did appear in the first issue." When I requested another copy of that first issue, Micropo did not offer to replace it with the same. Several people I know had 1.0 programs that worked well for them. If yours works, no need to patch or replace. I have no way of knowing how Micropo handled this with other users. The new version 1.2 is reviewed in this month's column. Check with Micropo or your dealer regarding update policy.

On your second question about spelling checkers of the future, wish I were clairvoyant. Two programs I like that do replace the mistyped word with the correct one are Lifeboat's Microspell and a new issue from Oasis Systems, The Word Plus (also reviewed in this month's column).

I don't know if I'd want all my typos to appear in reverse as soon as they happen. This might be disconcerting for the creative process—perhaps it would be all right for short office letters.

—DZM

For HP users

News80 is a newsletter for Hewlett-Packard Series 80 users. Sample copies (\$2) and subscriptions (four issues for \$10) are available.

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AUGUST 1982

Explore the excellence of your ZX81 with a

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MEMOPAK 64k memory extension for **\$179.95**
Give your diminishing memory more byte.

MEMOPAK 64K RAM \$179.95

The Sinclair ZX81 has revolutionized home computing. The MEMOPAK 64K RAM extends the memory of ZX81 by a further 56K to a full 64K. It is neither switched nor paged and is Directly Addressable. The unit is user transparent and accepts such basic commands as 10 DIM A (9000). It plugs directly into the back of ZX81 and does not inhibit the use of the printer or other add-on units. There is no need for an additional power supply or leads.

Description of memory

0-8K . . . Sinclair ROM
8-16K . . . This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programs, and can be used to run assembly language routines.

16-32K . . . This area can be used for basic programs and assembly language routines.

32-64K . . . 32K of RAM memory for basic variables and large arrays. With the MEMOPAK 64K extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

MEMOPAK 16K RAM \$59.95

With the addition of MEMOPAK 16K, your ZX81 will have a full 16K of Directly Addressable RAM. It is neither switched nor paged and enables you to execute longer and more sophisticated programs and to hold an extended data base.

The 16K and 64K Memopaks come in attractive, custom-designed and engineered cases which fit snugly on to the back of the ZX81 giving a firm connection.

Free service on your MEMOPAK

Within the first six months, should anything go wrong with your MEMOPAK, return it to us and we will repair or replace it free of charge.

Try MEMOPAK with no obligation

You can use our MEMOPAK in your home without obligation. After 10 days if you are not completely satisfied, simply return it for a full refund.

Coming soon . . .

A complete range of ZX81 plug-in peripherals:

MEMOTECH Hi-Res Graphics
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All these products are designed to fit "piggy-back" fashion on to each other and use the ZX81 power supply.

Further information forthcoming.

Memotech Corp. 7550 W. Yale Ave. Suite 220 Denver, Colo. 80227

Yes! I would like to try the Memopak. I understand that if I'm not completely satisfied, I can return it in 10 days for a full refund.

Price + Qty. Amount

<input type="checkbox"/> Check	Memopak 64k RAM	\$ 179.95		
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<input type="checkbox"/> MC	Shipping and Handling	\$ 4.95		\$ 4.95
Total				

Act. No. Exp. † U.S. Dollars

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MEMOTECH

Memory Extension Specialists

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7550 West Yale Ave., Suite 200
Denver, Colorado 80227
Ph.(303) 986-1516

CALENDAR

Aug 1-4 Microcomputer Applications in Education Workshop, Cloud's Cal-Neva, Lake Tahoe, NV, focuses on computer relationships with teachers and administrators. University of Nevada, Reno Division of Continuing Education, Reno, NV 89557.

Aug 8-14 Institute for Coordinators at Academic Computing, State University College at Potsdam, NY, has been cancelled. Associated Colleges of the St. Lawrence Valley, Potsdam, NY 13676.

Aug 9-13 Seminar on data communication networks, College of Engineering, University of Michigan, Ann Arbor, MI, discussion of alternative networking strategies for computer systems that use data networks. Engineering Summer Conference, College of Engineering, University of Michigan, Chrysler Center, N. Campus, Ann Arbor, MI 48109.

Aug 12-13 Microcomputers in Vocational Education Conference, Sheraton Inn, Madison, WI, will introduce beginning as well as advanced applications of software programs to vocational education curricula. Vocational Studies Center, 964 Educational Sciences Building, 1025 W. Johnson St., Madison, WI 53706.

Aug 15-18 Computer Engineering Conference and Exhibit, Sheraton Harbor Island Hotel, San Diego, CA, more than 600 expected attendees participating in discussions and exhibitions on latest developments in the computer engineering market. Included are current data on costs, labor and investment returns. American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.

Sep 2-3 Computer trade show, Convention Center, Indianapolis, IN, features national, regional and local exhibitors. Ernie Kerns & Assoc., 2555 E. 55th Pl., Suite 201, Indianapolis, IN 46220.

Sep 8-11 IBM PC Annual Convention and Exhibition, Golden Nugget Hotel-Casino, Atlantic City, NJ. Products and programs will be displayed. Sponsored by Personna. Atlantic Data Supply Corp., Highway 88, Brick, NJ 08723.

Sep 11-12 Microcomputer Show and Fleamarket, Holiday Inn North, Newark, NJ, Commercial exhibitors and fleamarket sales. Kengore Corp., 3001 Route 27, Franklin Park, NJ 08823.

Sep 14-16 Mini/Micro Conference and Exhibition, Disneyland Hotel, Anaheim, CA, is not a user-oriented show; designed for a more specialized OEM audience. Electronic Conventions, 999 N. Sepulveda Blvd., El Segundo, CA 90245.

Sep 20-24 International Symposium on Subscriber Loops and Services, Toronto Hilton Harbour Castle Convention Centre, Toronto, Canada, will be concerned with strategies for economically introducing services into the telecommunication network. The Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08854.

Sep 28-30 Federal Computer Conference, Sheraton Hotel, Washington, D.C., a forum for information exchange by Federal ADP users. Federal Education Programs, Box 368, Wayland, MA 01778.

Sep 29-Oct 1 International Peripheral Equipment and Software Exposition, Convention Center, Anaheim, CA, devoted exclusively to evaluation, selection and application of peripherals and software. Cahners Exposition Group, 222 W. Adams Street, Chicago, IL 60606.

Oct 1-2 Conference on Classroom Applications of Computers, San Jose, CA, includes workshops, field trips, speakers and commercial exhibits. Computer-Using Educators, P.O. Box 18547, San Jose, CA 95158.

Oct 5-7 Southwest Semiconductor Exposition, Civic Plaza Convention Center, Phoenix, AZ, will feature manufacturing suppliers of equipment and materials dedicated to semiconductor, PCB and hybrid industries. Cartilage & Assoc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086.

Oct 11-14 Information Management Exposition & Conference, New York Coliseum, NY, concentrates on management aspects of information and will devote intensified attention to software. Clapp & Poliak, 708 Third Ave., New York, NY 10017.

Oct 17-20 Data processing management conference and exposition, Chicago Marriott, Chicago, IL, focuses on operational management. Data Processing Management Assoc., 505 Busse Highway, Park Ridge, IL 60068.

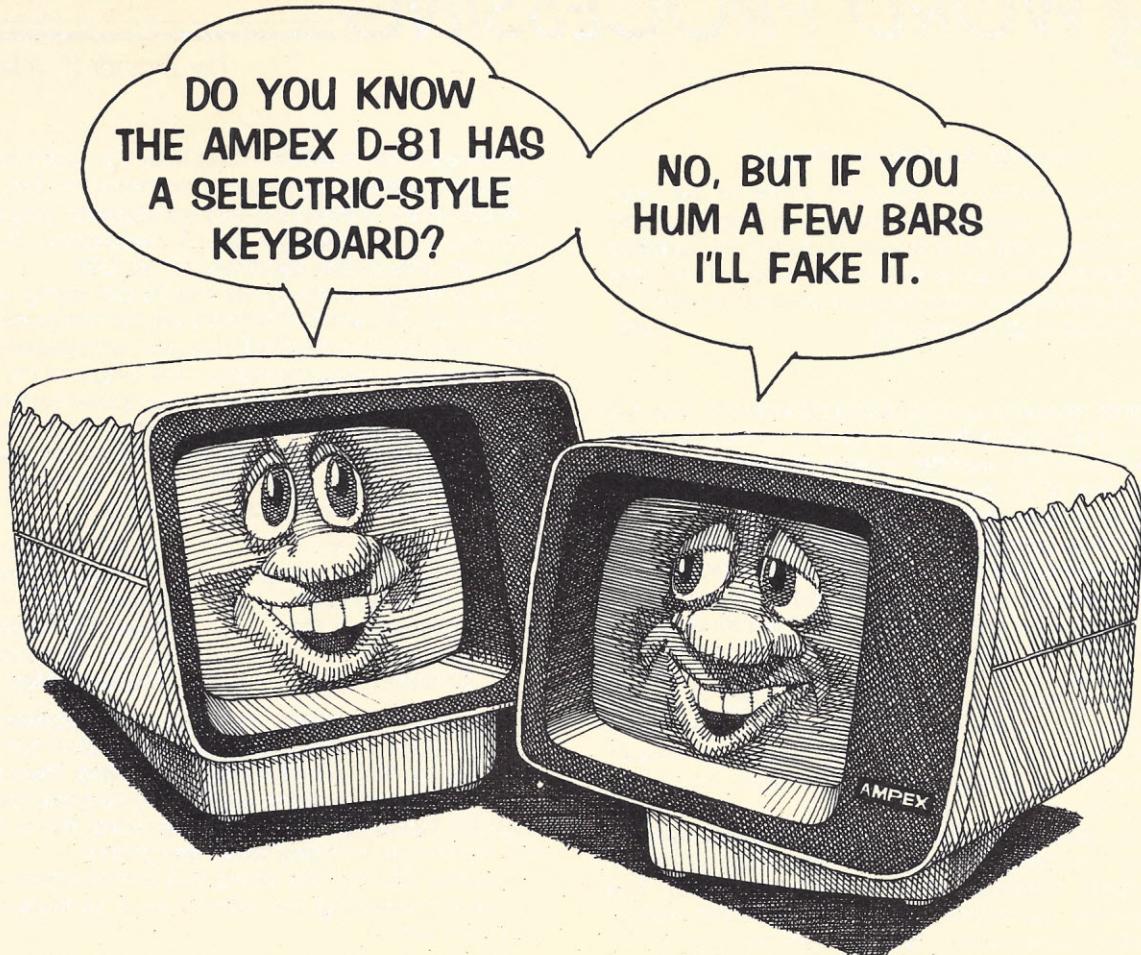
Oct 20-23 Personal Computer Show, Hyatt Convention Centre, Singapore, will feature displays on every aspect of small computers. Overseas Exhibition Services Ltd., 11 Manchester Square, London W1M 5AB, United Kingdom.

Oct 21-24 National Computer Conference and Expo for Educators, L.A. Convention Center, Los Angeles, CA, will offer seminars, workshops, demonstrations, and exhibits. Judco Computer Expos, Box 963, Scottsdale, AZ 85252.

Oct 27-29 Federal Office Automation Conference, Sheraton Hotel, Washington, D.C., includes seminars and workshops on management, applications, technology and major issues as well as equipment and services exposition. Federal Office Institute, Box E, Wayland, MA 01778.

Nov 9-11 Electronics exposition, San Jose Convention Center, San Jose, CA, will feature displays of production equipment, tools, hardware, supplies and test instruments. Cahners Exposition Group, 222 W. Adams St., Chicago, IL 60606.

Nov 9-13 Electronic component and subassembly trade fair, Munich, West Germany, will feature semiconductors, passive, electro-mechanical components, connecting elements and sub-assemblies, as well as technical congresses on micro and macroelectronics. Kallman Associates, 5 Maple Court, Ridgewood, NJ 07450.



The Ampex D81. It does everything but hum.

Here's a buffered editing terminal that's right in tune with today's operator needs: Detached, familiar Selectric-style keyboard. Conversational or block mode operation. Non-glare 12" diagonal screen with amber, green or white phosphors. Two or four pages of displayable memory. Twenty programmable function keys. Complete range of visual attributes. And complete editing, formatting and protected field capability. All packaged in a distinctively elegant design that

harmonizes with any work station decor. And at a price that's music to your ears.

Today, find out more about the D81. And about the full line of Ampex terminals including: the **D80** — similar to the D81 but with a detached, conventional keyboard; and the **D30** — the interactive terminal whose economy and ease of operation make it ideal for basic data communications.

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 Flex-Comm Int'l, Inc., GA (404)237-9242 □ Tek-Aids Industries, Inc., IL (312)870-7400 □ Midtec Associates, Inc., KS (913)441-6565
 Data Systems of Baton Rouge, LA (504)923-0888 □ Micro Computers of New Orleans, Inc., LA (504)885-5883 □ S & S Electronics, Inc., MA (617)458-4100
 Computer Solutions, Inc., MI (313)588-1998 □ Washington Electric Co., NY (212)226-2121 □ A.C.S., Inc., PA (215)947-5590 □ Interfaces Ltd. Corp., PA (412)941-1800
 Chronotex, Inc., TX (512)656-2733 □ Kent Computer Corp., TX (713)478-0077 □ R. Associates, Inc., TX (713)870-1500 □ Escom, WA (206)881-1113

WORD PROCESSING

by Dona Z. Meilach

Offering Additional Proof

This monthly column will spotlight many of the new word processing software releases—including proof-readers, indexes and all manner of dictionary-related software. Dona Z. Meilach will also provide user tips, case studies and interviews, and items of general interest to the word processing community.

—ed.

Our original review of proofreading software (IA May 82) promised further investigation of programs as they became available. This month, we offer reviews of three additional programs: The Word Plus, Spell and Spellstar. All have appealing (and different) capabilities to cater to a variety of needs. Prices range from \$49.95 to \$250. Each is so easy to use it would be foolhardy to produce correspondence or text without subjecting it to computer proofing.

Whether you write one page or 5,000 words a day, a spelling check can assure you of almost error-free text—"almost" because none of the programs can detect syntax error. Of the three, only The Word Plus provides lookup help for words with letter combinations most frequently missed—but not all words. None will correct a word not in the dictionary that you *think* you have spelled correctly.

The three spelling checkers reviewed worked rapidly, accurately and efficiently. All offer the ability to create a specialized dictionary and to revise it readily. The programs may be invoked through some text editors such as the R command in Wordstar, or through CP/M. The manuals are clearly written.

The Word Plus, version 1.0 (Oasis Systems, San Diego, CA) was authored by Wayne Holder and retails for \$150. The easy-to-follow manual comes in 50 photocopied pages.

This is a valuable new offering that adds Automatic Correction to the original program, *The Word* (IA May 82). Automatic correction means that the error word can be replaced in the text automatically, compared with only marking it—and then returning to the text to correct the marked words.

The Word Plus can run with almost any amount of memory, but a minimum of 32K bytes is suggested. A 48K-byte system is most advantageous for creating new dictionaries conveniently. It is compatible with most word processing programs.

Both The Word Plus and The Word are written in modular units, referred to as tools, so each tool may be used individually or in conjunction with others. This versatility saves time. If you wish to use the Word Count tool for example, you invoke WC. The total number of words appears in under 8 seconds.

Context-checking is possible

The checking and lookup features of The Word are available in The Word Plus and used in a different progression: the correct spelling of a word may be looked up as you progress through the menu rather than at the end of the text checking. You may also ask to see each misspelled word in context before you proceed to the next word. This is a dynamic new feature.

Following is the procedure using the new Automatic Correction feature. The Word Plus is in drive A; and text.doc in drive B:

A>TW B:text.doc (return)

A series of six questions asks how you want to handle the document/dictionary/dot commands, etc.

A summary of your answers will appear; you have the opportunity to change any if necessary. This menu requires only a few seconds. Hit RETURN.

The spelling review goes into its act using Spell. The system's 45,000 word dictionary will be compared to your text (unless you've created your own and asked to use it). The time required depends on the length of the text and the speed variables of different computer systems. Proofreading only (not correcting) the first 697 words of this text took 58 seconds using a Zobex Z80 8-in. double density floppy disk system and a Zenith H89 terminal.

Review provides the following choices:

Add word to:	Other Options:
U>pdate Dictionary	P>previous word
S>PECIALS.CMP	N>ext word
M>isspelled list	R>esume review.
D>iscard	L>ook up word
C>orrect word	V>iew context

The word "misspelled" appears on the screen with the options above. Hit V> to view the word in context and L> to lookup the word for proper spelling. Then proceed with the disposition of the word. If you've gone too rapidly, you can backtrack to a previous word; this is a feature not available in many other programs.

Another plus for The Word Plus is that when you have finished correcting the words, your actions are summarized with:

—words corrected
--words changed length *reform*

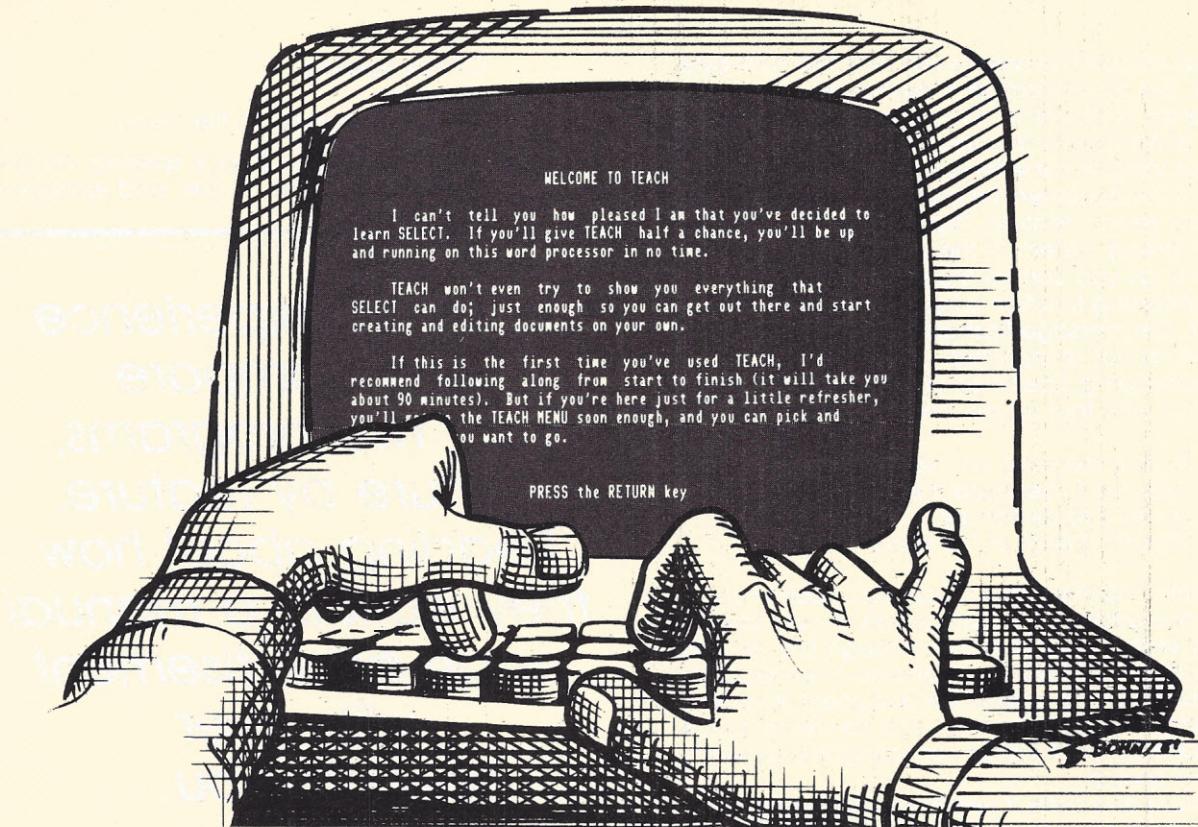
The efficient handling of hyphens is another positive feature important to those who work with narrow columns of type where hyphenated words are rampant. The program handles hyphenated words by treating the hyphen as a space. The hyphenated words are checked against the dictionary separately. Words properly broken at the end of a line are reassembled before they are compared. In some programs, the portions of the hyphenated words may be treated as two separate error words, unless each syllable happens to form an individual word.

The Word Plus has incorporated all the extras of The Word: switches for flexibility such as marking the word in text, printing and/or displaying the error words on the terminal. There is a Word Frequency feature that lists (on the terminal or printer) how many times each word was used in the text. There are: the Anagram feature, the Find feature, the Homonym Helper, the ability to create new dictionaries and to easily subtract words from them. There are more than enough tools in The Word Plus to keep a word freak entertained for hours. For those who make a living from creative word usage, its variety and efficiency are unmatched.

Spell, version 1.5 (Software Tookworks, Sherman Oaks, CA) was authored by Robert Wesson and retails for \$49.95. The 18-page photocopied manual includes: 18,500 root words in the 64K-byte dictionary; 15,600 root words in the 48K-byte dictionary. The prefixes and suffixes will recognize more than 50,000 words.

Spell is a spelling error-detection and marking program that runs on 8080 and Z80 microcomputers with CP/M or the Heath/Zenith HDOS operating systems and is compatible with most text editors. It requires a minimum of 48K bytes of RAM and at least 30K bytes of disk storage

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space. It can be used on systems with only one 100K-byte 5½-in. disk, but more storage is desirable.

The program is simple to run. It works through the R command of Wordstar or through CP/M. It marks the error word by replacing its last letter with a # in the document. You return to the document for correcting, using the text editor global search feature. The only caution with this and any marking system is the possibility of making another error as you correct the original.

The proofreading function is incredibly rapid. In only 18 seconds, the message flashed that 697 words were read: 33 words not recognized.

After proofreading, Spell presents the following menu one time only with four review choices:

M>ark the word as misspelled
I>nore it, because it is correct
A>dd it to dictionary
R>add a Root of the word

Immediately, and in shotgun succession, each time you hit RETURN, one additional word appears on your screen. It took only eight seconds to run through the list and place an M after each word and another three seconds to actually produce the mark in the document or update the dictionary. Within 29 seconds, you can return to the document and correct it. Actual correcting time depends on your own speed.

Other options and default switches make the program flexible. You can elect to list only the misspelled words and bypass word review. A lookup mode will scan a document for words not in the initial dictionary and list them on the terminal alphabetically without choices. You may input these words to your dictionary for editing or adding. This is particularly helpful for creating a dictionary of special terms: A medical vocabulary, for example, would automatically be alphabetized and available for dictionary usage. (Do not confuse Spell's LOOK UP mode with that of The Word Plus, where LOOKUP finds the correct spelling of the word.)

Spell offers basic proofing detection capabilities with enough—but not too many—extra frills. Its basic function of proofing and marking can be learned in a matter of minutes.

Spellstar features dictionary maintenance

Spellstar, version 1.2 (Micropro Int'l, San Rafael, CA) is available in most CP/M versions for \$250; the Apple CP/M version retails for \$195. The program comes in 5½ or 8-in. disk formats. The clearly-explained manual includes 21 photocopied pages. The dictionary includes 20,000 words.

The program is designed to operate through Wordstar 3.0. Spellstar requires another 30K bytes of disk space in addition to Wordstar's 78K bytes for a total of 108K bytes. Users of 5½-in. disks will require three disks: #1 for Wordstar and Spellstar files, #2 for the document to be checked, #3 for Spellstar's main dictionary. For 8-in. system (depending upon disk storage capability), the program will work with one or two disks.

Spellstar's main functions are to check spelling and to maintain dictionaries. Words checked during spelling can be added to the dictionary. But the dictionary is maintained and upgraded from the spelling check.

Spellstar is invoked through the Wordstar's S command. Once you provide the file name, the menu will ask:

C heck spelling
M aintain
X exit to Wordstar no-file menu.

Assume you selected C to Check spelling. Another menu asks for the dictionaries to use, and establishes

*...try to experience
and compare
any two programs,
feature by feature.
Reading about how
they work in a manual
or an advertisement
will never
prepare you...*

checking controls selected. When the few queries are satisfied, the menu will appear, indicating:

Number of words in document 654
Number of different words 307
Number of words in main dictionary: 21074
Number of words in supplement
Number of words checked: 11581 (This varies)
Number of misspelled words 47
Total number of misspellings . . . (given after marking)

At this point, errors are not yet flagged in the file: You may elect to list all unmatched words on the screen and not have words marked in the file. Once marked, you begin the correcting procedures in the document. Hyphenated words are treated as two separate words; but those separated at the end of a line with a soft hyphen (using Wordstar's hyphen-help) can be treated as a single word. The number of words checked will not necessarily match the total words in the dictionary. A program knows when it has completed the proofreading.

The program marks an unmatched word with a ^@ in front of it. At the same time, it creates a new file of the document, with the extension .@@@. that contains the flagged words.

You can:

F>ix word
B>ypass word
I>nore word
D>add to dictionary
S>add to supplemental dictionary

Should you elect to Fix, you will automatically get Wordstar's edit mode and correct the word as you proceed.

Continued on page 144

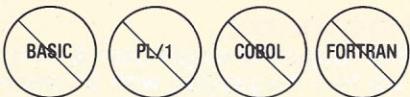
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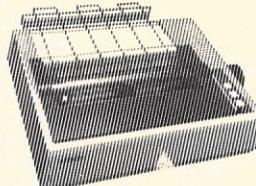
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by Robert Moskowitz

The Learning System

The Learning System (TLS) version 1.0 (Micro Lab, Highland Park, IL) is a clear attempt to provide sophisticated computer-aided instruction (CAI) on a microcomputer. The program, priced at \$150, requires a 48K-byte Apple II with one or two minifloppy drives and DOS 3.3.

While flexible enough to instruct learners on virtually any type of factual material, there are certain applications for which TLS seems particularly suited.

For example, a school teacher—from early grades right up through graduate school—can program TLS with a series of lesson plans covering a topic or unit of information. Each tutorial may consist of background information and questions having one or two correct answers specified by the teacher. The entire series may be saved onto one or more disks, and is available for student access as individual schedules permit.

Once one or more units of information have been programmed, each student may use a Player disk to bring up the system in a limited fashion and interactively go through the material at his own most comfortable speed. Each student is free at any time to change from the Instruction Mode (where the answers are available) to the Test Mode (where they are not), and scores are recorded.

A student can continue in the Instruction Mode as long as desired without supervision, but when the Test Mode is selected, the session has a definite end. The system locks and the teacher must use a special Master disk to record the student's scores, allow TLS to re-cycle, and return control to the learner. Used in this way, a single teacher can employ programmed materials and multiple Apples to manage the learning of many students.

There are also potential applications for a business owner or manager, who can pre-program specific instructions for handling office procedures or equipment and turn the actual employee training over to the Apple. Once the employee is oriented to the computer, he can work through the materials with virtually no supervision. The learner has full control over selection and pacing through any number of instructional units. The instructor is free for other work, and is only needed at the end of a test session to unlock the machine and record performance. Because the computer is managing the material, the instructor can be confident that all trainees will be presented with all necessary information—with nothing left out, overlooked or forgotten.

Factual-type learning is most suitable

TLS is a multi-disk program that stores and interactively presents a variety of materials and information related to the learning process. It can be programmed with anything from traffic safety rules to office procedures—and beyond. However, both the general format for interactions and the available space make the program most suitable for factual-type learning.

For example, history lessons covering the Napoleonic Wars—with names, dates and important battles—would be well-suited. Interpretations of the same information, which may be full of subtle judgements and warrant essay-type answers to interpretive questions, would probably not work well. Similarly, medical training, which calls for lengthy explanations and judgmental conclusions based on diverse data, might suit the format but may not fit in

the space allotted for background information, questions, hints and answers.

Work with the system begins by booting the Master disk. From this boot, the instructor can run tests, create tests, write background information for tutorials, access students' test scores or total group performance on the individual tests, delete records, initialize more disks or exit. On the first boot, one must initialize at least one Records disk and one Tests disk.

The Records disks are used for storing student scores and group performance on each test. The instructor can restrict access to this information while leaving the rest of the system open for student use. The Tests disks are used for storing tests, hints and answers. Informational compositions can be linked to tests and made available to students, or unlinked and withheld.

Self-contained tutorials are possible

A single test can include up to 25 fill-in questions, up to 25 multiple-choice questions, or up to 10 sets of matching phrases. Formats cannot be mixed—a given test must be all one or another. If all types of questions are to be used, a series of separate tests covering various aspects of a single test subject need to be created.

On the fill-in type, the instructor has 116 characters for the question, 25 characters each for a primary answer and an optional alternate answer. There are also 75 characters available for an optional hint—made available only in the Instruction Mode. The program will accept either possible answer from the student as correct, but requires an exact character-by-character match—including internal spaces—or it records the answer as wrong. Misspellings and typographical errors can harm a student's score unless each student's record is manually examined for such errors.

On the multiple-choice type, the instructor has 70 spaces for the question, and 35 spaces for each of up to five possible choices. There is automatic entry for "All of the above" and "None of the above." There is no room provided for hints with this type of test.

On the column-matching format, up to 10 primary phrases can be entered, one at a time, and a matching phrase is given for each one. After 10 sets of phrases, there is an option to add one or two more fake phrases for the matching column to make guessing a little tougher for the learner.

For all formats, the Create sequence is full of requests for confirmations and opportunities to rewrite one or all of the questions. Once the test is saved to disk, you can still use the Modify sequence to make additional changes at almost any time.

One of the best features is "Compositions." These are informational elements that can be linked to one or more tests, question by question. Thus when a learner calls up a package of instructional material, he is also presented with the composition linked to that package.

This enables the creation of a self-contained tutorial. For example, a Composition could be written for police trainees on the correct procedures for apprehending suspected criminals. Each element may be 150 characters long, and one may be written for each question. With the composition complete, the program may be used to create a test on the very same information, then the

Continued on page 145

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the electronic worksheet for CP/M users.

AUTOMATIC
WHAT-IF

ROW 1 (Net Sales) <--					MODE=NORMAL	ORDER=R/O	ROW=1-50
ENTER COMMAND:							
ROW	First Quarter	Second Quarter	Third Quarter	Fourth Quarter			
1 Net Sales	1,000.0	1,100.0	1,210.0	1,331.0	4,641.0	44	DATE
2 Cost of Good	450.0	489.5	532.4	579.0	2,052.9	45	NATE
3 Gen & Admin	200.0	220.0	242.0	266.2	928.2	46	INVERSE
4 Res & Develo	300.0	350.0	400.0	450.0	1,500.0	47	INTEGER
5 Total Costs	950.0	1,059.5	1,174.4	1,295.2	4,479.1	48	ROUND
6 Gross Profit	50.0	40.5	35.6	35.8	161.9	49	CUMULATE
7 % Profit	5.0	3.7	2.9	2.7	3.5	50	ABSOLUTE
8	0.0	0.0	0.0	0.0	0.0	51	ADD K
9	0.0	0.0	0.0	0.0	0.0	52	SUB K
10 % C.O.G.S.	45.0	44.5	44.0	43.5	0.0	53	MULT K
11	0.0	0.0	0.0	0.0	0.0	54	DIV K
12	0.0	0.0	0.0	0.0	0.0	55	SUM
13	0.0	0.0	0.0	0.0	0.0	56	GET
14	0.0	0.0	0.0	0.0	0.0	57	ZERO
15	0.0	0.0	0.0	0.0	0.0	58	
16	0.0	0.0	0.0	0.0	0.0	59	
17	0.0	0.0	0.0	0.0	0.0		

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For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true backspace, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

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Bidirectional printing	X	X	X	X	X	X
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	X	X	X	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	X	X	X	X
Selectable paper feed			X		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		X	X	X
Programmable form length	X	X	X	X	X	X
Programmable horizontal tabs	X	X	X	X	X	X
Skip over perforation			X	X	X	X
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	X	X	X	X	X	X
Italics character font		X		X	X	X
Special international symbols				X	X	X
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	X	X	X	X	X	X
Subscript/Superscript print mode				X	X	X
Underline mode				X	X	X
10 CPI	X	X	X	X	X	X
5 CPI	X	X	X	X	X	X
17.16 CPI	X	X	X	X	X	X
8.58 CPI	X	X	X	X	X	X
DOT GRAPHICS MODE						
Line drawing graphics				X	X	X
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	X
CONTROL FUNCTIONS						
Software printer reset	X			X	X	X
Adjustable right margin			X	X	X	X
True back space	X			X	X	X
INTERFACES						
Standard — Centronics-style 8-bit parallel	X	X	X	X	X	X
Optional — RS-232C current loop w/2K buffer	X	X	X	X	X	X
RS-232C x-on/x-off w/2K buffer	X	X	X	X	X	X
IEEE-488	X	X	X	X	X	X

*Tandy TRS-80 block graphics only available with GRAFTAX 80.

ABCDEFGHIJKLMN abcdefghijklmn ABCDEFGHIJKLMN abcdefghijklmn Ø1234

ABCDEFGHIJKLMN abcdefghijklmn ABCDEF GHIJKLMN abcdefghijklmn Ø1234

ABCDEFGHIJKLMN abcdefghijklmn ABCDEF GHIJKLMN abcdefghijklmn Ø1234

ABCDEF abcdef ABCDEF abcdef Ø123456

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz ABCDEF GHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz Ø1234567

ABCDEF abcdef ABCDEF abcdef Ø123456

ABCDEFGHIJKLMN abcdefghijklmn ABCDEF GHIJKLMN abcdefghijklmn Ø1234

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz ABCDEF GHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz Ø1234567



by Patrick and Leah O'Connor

Zebra II

In the March column, we presented the Zebra Problem and challenged our readers to solve it using their micro-computers. Since this column elicited more response than any other we have recently written, we would like to share some of the best solutions.

The first proposed solution came from Bruno Caprez, president of Keystone Systems, a software house in Spokane, WA. Although Mr. Caprez did not actually program a solution, his letter does present a systematic method for pruning down the possibilities.

His solution is based on a two-step process. The first step is to reduce the number of possible combinations that need to be checked. If 24 billion combinations can be quickly honed down to a few thousand, a solution can be found. The second step takes the remaining few thousand possibilities and checks them within a loop.

To quickly reduce 24 billion combinations is not as difficult a process as one might think. For each possible permutation (of which there are 120), we would assign a number 1 to 120. Each of the five rows would be assigned as having an initial possible number of permutations—120 numbered 1 to 120. An array of dimension DIM P% (5,120) would be initialized as five rows, each column having values 1 to 120.

A general solution is the goal

Our problem starts out as having the following number of solutions:

$$120 \cdot 120 \cdot 120 \cdot 120 \cdot 120 = 24,883,200,000$$

Now we work the given clues against this data structure of combinations. Some clues (for example, number 9) only affect one row. Others affect two rows, at most. Keeping our goal of a general solution, a subroutine would be written to handle clues that are in the form of clue numbers 8 and 9. A fixed value must be given a fixed position. For clue 9, "the Norwegian is in the leftmost house," the mainline pass to such a subroutine would be:

ROW% = 1	Which row is affected?
FIXED% = 1	The position (column one)
VALUES\$ = "Norwegian"	and the fixed value
GOSUB FIXED-POSITION	Call to this type of clue

Subroutine FIXED-POSITION would go through Row 1 possible permutations and remove those that do not qualify. Array P% (5,120), row 1 would contain only 24 numbers and the rest zeros. The 24 numbers would represent the 24 permutation values that still qualify. Only after 120 IF statements, our problem is reduced to the following number of solutions:

$$14 \cdot 120 \cdot 120 \cdot 120 \cdot 120 = 4,976,640,000$$

Do the same with clue 8, "milk in the middle house."

ROW% = 4
FIXED% = 3
VALUES\$ = "Milk"
GOSUB FIXED-POSITION

Again, after little computer time, we would have:

$$24 \cdot 120 \cdot 120 \cdot 24 \cdot 120 = 995,328,000$$

All the questions are of only four types. Clues 8 and 9 are a fixed value in a specific location. Clue 1,2,3,4,6,7,12 and 13 are all the same, a fixed relationship in one

The memory... and time requirements are well within the reach of a microcomputer solution.

column. The pass from the mainline for this group would be as follows:

```
ROW1% = 1
VALUE1$ = "Englishman"
ROW2% = 2
VALUE2$ = "red"
GOSUB FIXED-TIE
```

This subroutine would eliminate permutations in either of the involved rows that are impossible. The subroutine would go through ROW1% and ask if it is still possible for the Englishman to be in position one. If yes, the program would continue to the next column. If no, the program would eliminate all permutations in ROW2% that would allow VALUE2\$ in column one, then go on to the next column.

Clues 10, 11 and 14 make up the third group of clues. As with the second group, a subroutine would be written to eliminate permutations. Take clue number 11, "Kools are next to the house with the horse." If, for example, it was found that Kools cannot be in the second house, all permutation would be removed in row 5 that would allow the horse to be in the first house.

Clue 5 is one-of-a-kind in this problem, and makes up our four types of clues. It would eliminate many of the 120 beginning permutations for row 2.

Once a pass has been made for each clue to these four different subroutines, the program should loop for three to six times and try all group 2 and 3 clues over again. This is because the additional information gained in processing clue 4, for example, may create more permutation elimination when clue 3 is done again.

After this process, our problem reduces to:

$$7 \cdot 2 \cdot 14 \cdot 4 \cdot 12 = 9,408$$

Then the second step of our program takes over and loops and grinds away, checking each of the 9,408 to find the final solution(s).

The memory requirement for the array space and code and the time requirement are well within the reach of a microcomputer solution.

Another excellent solution was sent in by David Cromley of Cheyenne, WY. Like Caprez's solution, Cromley's uses the puzzle statements as rules for eliminating incorrect combinations.

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PORTABLES

by Bob McElwain

Pockets: The Next Generation

Radio Shack calls its new handheld computer the PC-2. It is actually the Sharp 1500. By whatever label, the unit is a notable refinement of its predecessors, offering greater speed, more memory and an enhanced Basic.

The PC-1500 features an 8-bit microprocessor, a real-time clock and 1.3MHz operation. A 16K-byte ROM provides the operating system interwoven with Basic. User memory is 2.6K bytes with 1,851 bytes available for the program. Both 4K and 8K modules are available.

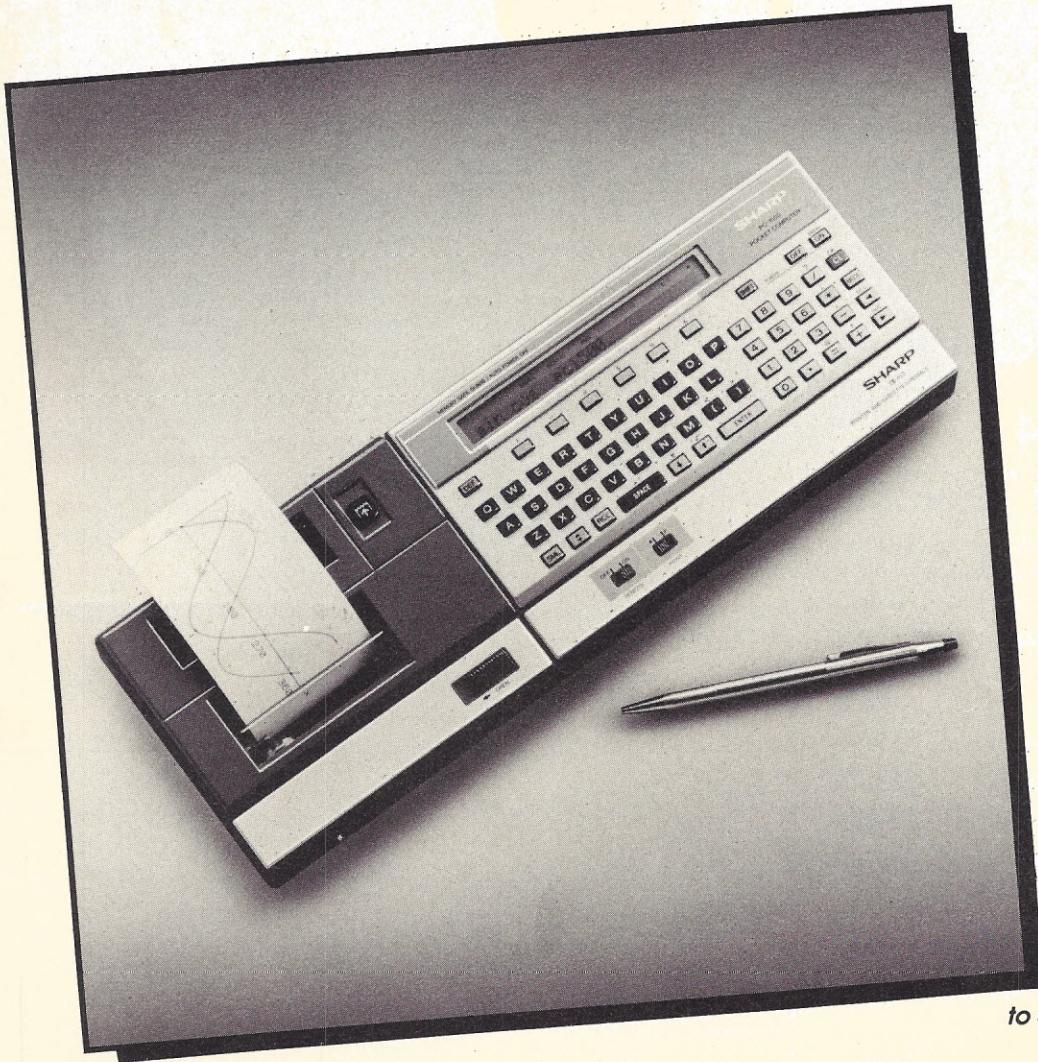
The new keyboard is arranged in typewriter style with a numeric scratchpad on the right. Lower case characters are available. Although the keyboard is larger, it is more difficult to use. It's not large enough for real typing, yet it's too large to reach all keys conveniently when hand-held. Data entry with the numeric keys, however, is comparatively efficient.

The liquid crystal display handles 26 characters. It's column-addressable when treated as a 7-by-156 grid. Any combination of 7 points can be displayed in any column with the appropriate hex code. Simple graphics can be implemented.

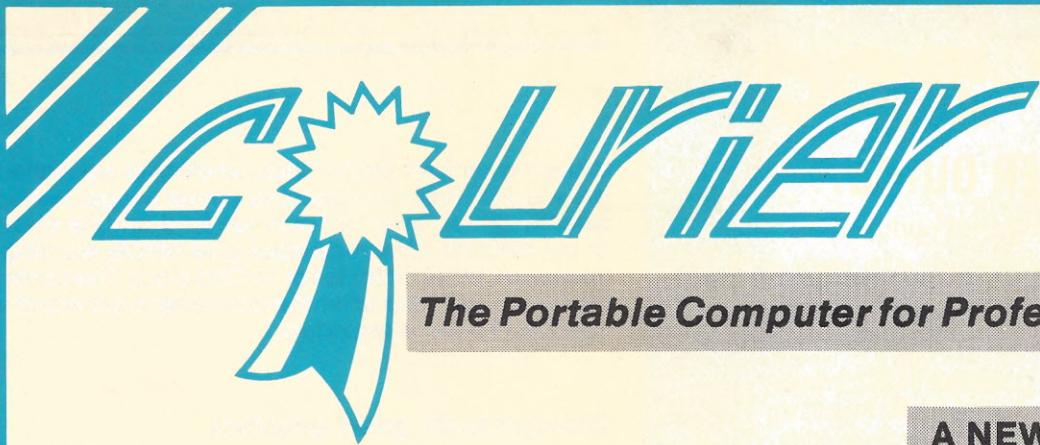
The computer is about 8-in. long, 3-3/8-in. wide and 1-in. thick. It weighs nearly a pound. At this size and weight, the name "pocket computer" may become inappropriate.

Most users will prefer a briefcase to a pocket. The unit is powered by four AA type dry cell batteries. At a rated .13W consumption, the unit is expected to run for 50 hours. When linked to the printer-cassette interface, which is powered by rechargeable Ni-Cads, the computer

Although the keyboard is larger, it is more difficult to use. It's not large enough for real typing, yet it's too large to reach all keys conveniently when hand-held.



The PC-2/1500 is about 8-in. long and weighs more than preceding pocket computers; it may be most suitable to enclosure in a briefcase.



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draws power from the Ni-Cads, whether or not batteries are loaded. With considerable printer usage, I've consistently gotten over 12 hours run time on one charge of the Ni-Cads. Error messages give ample warning of low power in the batteries or Ni-Cad pack. The contents of memory are held when the computer is turned off. An auto-off feature is provided.

Unexpectedly good graphics

The printer has attracted considerable attention. It prints in four colors with graphics capability. The 2½-in. paper is gripped firmly on each side, allowing movement of the paper up or down. The printing mechanism holds four small ballpoint pens in a revolving cylinder. Lines are drawn horizontally to a specific length. The combination of pen and paper movement provides unexpectedly good graphics. Those with a need for simple graphs will appreciate this capability.

Characters are also drawn by the printer, rather than imprinted. Nine sizes of text are available, but use of the larger sizes will be limited. All sizes are easily read. The second size may be the most commonly used. Six and a half lines are printed per inch with 17 characters per line. The smallest size prints 36 characters per line and 12½ lines per inch. This is a nice size for listings to be saved for occasional reference. The drawing pens do present one problem; they dry out quickly. In one period of daily use, a set of pens faded noticeably in two weeks (perhaps 40-50 hours of continuous printing). Since the printing mechanisms are involved, reliability is yet unproven.

When mounted on the printer unit, the computer is flush with the printer. The entire unit is approximately 13-in. long and 4½-in. deep. The unit tapers from a height of over 2-in. in the back to about 1½-in. in the front. It weighs two pounds, including internal Ni-Cad battery pack.

The printer unit contains a cassette interface that provides for saving/loading programs and data to/from tape. The unit will connect to two cassette decks simultaneously. The printer is delivered in a vinyl-covered carrying case with an AC adaptor, which weighs an additional 1.3 lbs. The computer/printer unit fits the case nicely with ample room for the A.C. adapter and extra supplies. The case is sturdy. Still, most will want the added protection of a solid briefcase.

The computer features an external 60-pin connector. When attached to the printer, the connector is extended to the back of the unit. This 60-pin connector may prove to be the most exciting feature of this computer. It doesn't require much imagination to foresee a variety of peripherals available in time.

Extended programming capabilities

The Basic is excellent—a much expanded version compared to its predecessor, used in the PC-1211. Programs written for the PC-1211 will load on the PC-1500, but they must be keyed in; tapes are not compatible. (Small changes will be required if the PC-1211 tricks were used. For example, MN, legal on the PC-1211, must be entered as M*N on the PC-1500.)

A comprehensive set of string functions is available, including LEFT\$, RIGHTS\$ and MID\$ for accessing parts of strings. The length of strings can be determined; they can

be concatenated and compared. Numeric data can be converted to ASCII and vice versa. Individual handling of all ASCII characters is provided for.

Both strings and numeric arrays are available. String arrays may be dimensioned to 256 elements, with any string length up to 80. Numerical arrays may be one or two dimensions with a maximum of 256 elements each.

Other features include READ/DATA, a RND function, trig and log functions, angle measure in degrees, radian or grads, logical AND, OR and NOT, and a set of printer/graphic instructions. A TIME feature provides typical clock functions. BEEP has been expanded; it's now programmable for pitch and duration.

A portion of memory, 624 bytes, is reserved for numeric variables A-Z, and string variables A\$-Z\$, 16 bytes each. (A and A\$ are stored in separate locations.) These variables can be accessed as arrays, using @(N) and @\$ (N). Two character variables are allowed. Such variables, and arrays of any kind steal space from program area.

Coding is easy and straightforward. The Basic is sufficiently comprehensive to be a match for most Basics. Code entry is slow. Although the keyboard is not easy to use, editing is easy. Cursor controls, left to right, move 26 characters of an 80-character line into the display as needed. Characters may be deleted, inserted or changed. Scroll forward and back is much faster than on the PC-1211. A program of several thousand bytes can be passed over in a matter of seconds. Another improvement over the PC-1211 is the speed with which an edited line replaces a previous line. This is extremely rapid.

A particularly nice feature of the PC-1500 has been retained. When an error occurs in running a program, pressing up-arrow (scroll backwards) reveals the errant line with the cursor positioned at the point in the line at which execution could not continue. The computer must be switched to PRO mode to correct the error. Up-arrow again displays the line and cursor. Further, the program can be examined as needed. CL, followed by up-arrow will continue to restore the errant line to the display until an edited line is saved.

Conventional rules of order are followed in processing any computation. Computed results are accurate to ten significant figures, positive or negative, with an exponential range from -99 to +99.

In RUN mode, the computer may be used as an extended calculator. All the mathematical functions of Basic are available. Statements are limited to 80 characters. The result is displayed when ENTER is pressed. The statement used to compute this result remains available. It can be restored to the display for further examination and editing by pressing either of the horizontal cursor controls.

The manual is much better than its predecessor. The first sections are well thought-out and will be helpful to beginners. About half-way through, however, the going suddenly gets tough. By industry standards for manuals perhaps this is sufficient. Beginners will need much more.

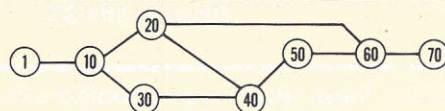
Comparison is difficult

I've been particularly troubled by omissions. It turns out that RUN erases data in program space. This is mentioned only as one entry in an obscure table toward the back of the manual. A second RUN mode (DEF mode) is available, in which this does not occur. However, in this mode, DIM statements are not re-executable. Since this is unusual in Basic, it should be clearly stated in the manual. In general, much one needs to know is simply not there. Since there is no index, hours can be spent searching, ultimately leading to the conclusion that the information needed is not available.

In a second volume, 71 well-varied programs are provided. The notes and documentation are good. Many programs provide good examples of usage, necessary for a full understanding of the system. In most cases, if these programs are to be added to your library, you'll want to modify and expand them.

Comparison of the PC-1500 to other computers is difficult. One must define this computer in some characteristic fashion and (by implication) link it to a group of machines.

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Since it lacks the truly miniaturized stature of the original pocket computer, comparisons to that machine are of limited value. Since an 8-bit CPU has been used, one might think to compare it to any number of micros.

When peripherals become available, the PC-1500 will be able to perform many of the functions of a micro (without a disk subsystem). But in order to obtain long battery life, execution speed has been sacrificed.

We previously reported times for the PC-1211 compared to the Casio FX-702P (IA May 82). In the accompanying

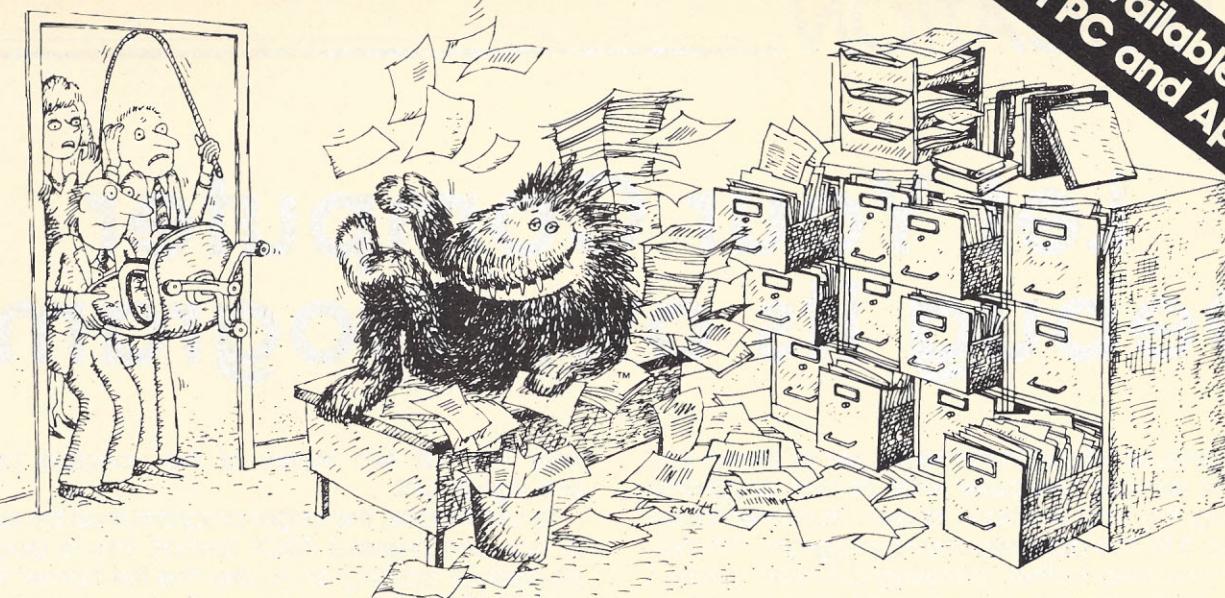
	Sharp PC-1211	Casio FX-702P	Sharp PC-1500
4: J=0		2:25	0:57
5: J=J+1			0:14
6: IF J<500 THEN 5			
4: FOR J=1 TO 500		2:02	0:08
: NEXT J			0:08
4: FOR J=1 TO 500		4:30	1:11
: A=5*B+C*D/J-7			0:38
: NEXT J			
4: FOR J=1 TO 500		13:28	5:40
: A=SQR(LOG 15+LN J)^14			4:00
: NEXT J			
4: FOR J=1 TO 500		4:32	0:58
: GO SUB 10			0:24
: NEXT J			
10: GO SUB 15: RETURN			
15: A=5: RETURN			
4: W=0		13:24	5:53
10: W=W+1			3:30
15: IF W>0 LET A=SQR(LOG W)^14			
20: IF W>0 LET A=INT(SIN 30*LN W)			
25: IF W<300 THEN 10			
(OUTPUT TO PRINTER)			
4: FOR J=1 TO 100		1:52	0:48
: PRINT "1234567890"			2:39
: NEXT J			
NUMBER CRUNCHER (HH:MM)			
	15:31	4:25	1:33
Speed comparisons (Time in MM:SS)			

figure, these results are repeated with the addition of these for the PC-1500. Note that the time for the PC-1500 in executing Tom Fox's demanding number cruncher shows the PC-1500 to be about 2 to 3 times slower than most micros.

In short, the PC-1500 is a new kind of tool, the essence of which is portability. True, a briefcase will be needed, but a small, slimline style will do nicely and leave ample room for papers and other items. □

Contributing editor Bob McElwain is a graduate of Pepperdine College with an MA in Mathematics from Boston College. He works with Los Angeles City Schools as a computer science instructor, and as a software consultant for business and industry. He's the owner of Hanco Software, specialists in software for handheld computers.

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Let Your Computer Debug its own Programs

In previous articles in this series, we've shown you how to let your computer write its own programs (IA Aug 81) and prepare its own documentation (IA Sep 81). The accompanying program, Proofer, goes one step further, allowing a TRS-80 model I or model III with disk drives to partially debug their programs by checking keyboard spellings and some syntax errors.

Some program errors caused by misspelled words lurk deep within seldom-called code. Ordinarily, obvious bugs will surface during program development, because the interpreter will note a syntax error when a line is run. However, other errors cannot be detected for some time, because the specific conditions invoking that program line are rare. In the worst possible situations, these mistakes are hidden in error traps designed to help the unsophisticated user, or they may cause loss of valuable data. Proofer will check every line of a program and detect all bad keywords. It will catch only typos, however. If you used LPRINT when you meant PRINT, the bug will slip by unchecked.

Proofer was inspired by the spelling checker programs that have become available during the last year. These useful software tools take any text document and compare each word against an internal dictionary. Any word in the text that does not appear in the dictionary is flagged as a possible spelling error.

This program works on exactly the same principle, but with a much smaller dictionary of 112 keywords. These words are found in Radio Shack's level II Basic, Disk Basic and the enhanced Disk Basic offered by Apparat for its Newdos 2.1 and Newdos 80 disk operating systems.

Proofer examines every word in a target program. It ignores words inside quotes—prompts, for example—numbers and arithmetic operators. The only letter combinations left are keywords, variables and misspelled words. Although it would be possible to tell which of the remaining words are variables—leaving only the incorrect keywords—I decided not to implement this feature. As written, Proofer has the added capability of providing a variable cross-reference listing that includes line numbers.

Not throwing out variables also means the operator has the opportunity to look for variables that may have been spelled wrong. PREVIOUS and PEVIOUS would appear as two different variables to the Basic interpreter, although PREVIOUS and PREVIOVS would not. With common Microsoft Basic,

only the first two letters of the variable name are significant.

To use Proofer, the target program must be saved in non-compressed ASCII format. This is accomplished by adding an A after the file name: SAVE "TESTFILEBAS:1",A. In addition, the program should not be tightly-packed with all spaces removed, but multiple statements per line are permitted. Keywords should have spaces separating them and there should be a space after a line number and before the first word in the line. Other spaces may be omitted. To proof a tightly-packed program, a utility such as Packer, from Cottage Software (Wichita, KS) is an indispensable tool, especially helpful for deciphering someone else's coding logic.

When asked for the target program name, enter the file specification of the previously-saved ASCII format program. Each line will be examined separately and all words not included within quotation marks compared with the internal dictionary. If a match is not found, the questionable word (which may also be a variable) is stored for later reference. The number of parentheses is counted, and any missing are noted. Proofer will also locate absent quotation marks and list all the variables used in the program. For those who are using Newdos 80 2.0, the bad words and variables are presented in sorted, alphabetical order. In all cases, line numbers are provided to make tracking errant bugs easier.

Briefly, Proofer works as follows. The 112 keywords are stored in a string array, WRDS(26,16). Each of 26 rows in the array corresponds to one of the 26 letters of the alphabet. The 16 columns allow for up to 16 keywords beginning with a letter. For example, ABS is stored in WRDS(1,1), while AND is placed in WRDS(1,2).

This is accomplished in a FOR-NEXT loop beginning at line 40. The keyword is read from a data line, and the first letter examined to determine its ASCII value. Then, 64 is subtracted to arrive at the alphabetic position, and the corresponding ROW of WRDS(row, col). CDBL, which begins with C (ASCII 67), is directed to Row 3 (67 minus 64). The column is determined by a counter, A, which is incremented every time a new keyword is read, and reset to one each time a new row is opened (A2<>PREVIOUS).

As disk operating systems gain new features in their Basics, Proofer may be updated to include these new keywords and commands. Add the word to the proper position in the DATA lines and change the 112 in line 40 to the new number of keywords.

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If a given letter of the alphabet now has more than 16 keywords, it will be necessary to redimension WRD\$(row,col) as well.

The target program (F\$) is opened, and a line at a time input into variable A\$. The first space in the program line is assumed to follow the line number, and the rest of the line is stored in SEG\$. A FOR-NEXT loop from one to L+1 (length of SEG\$) examines each character in the program line in turn.

When certain delimiters are reached, the program assumes that the end of a word or variable has been located. These delimiters include a space, quotation mark, comma, semicolon, parentheses, colon, and arithmetic signs such as plus, minus, equals and less than. At this point, control drops to a subroutine, where that portion of the line, TEST\$, is subjected to a series of tests.

If TEST\$ = "" (null), or if the value of the first character is greater than zero (signifying a number), the program jumps back and begins looking at the next section of the program line. Obviously, no variable or keyword can begin with a number.

When "REM" or its abbreviation "/" is encountered, the program knows that the rest of the program line should be ignored.

Once TEXT\$ sets past these checks, it enters a FOR-NEXT loop from 1 to 16, which compares TEST\$

with all the elements of WRD\$(row,col), beginning with the same letter of the alphabet as TEST\$. If a match is found, FLAG is set to one, and control drops to 670, where a counter, NU, is incremented, and the suspect word stored in string array BAD\$(n), along with the line number in which it appears. The word itself is positioned first, followed by the line number, so that the array may later be sorted into alphabetical order.

Then, TEST\$ is nullified, and the rest of the line examined for additional statements, variables and keywords.

Quotation marks as safeguard

Any time a quotation mark occurs, SFLAG is set to one and additional characters in a line are ignored until the second (close quote) is located. Then, the following words are considered and checked normally. Though no specific check for missing quotation marks is built in, they will stand out because in the final listing, words inside of prompts will be listed as bad words.

A check is included for absent parentheses, however. Each right parenthesis encountered in a program line increments variable RP, while left

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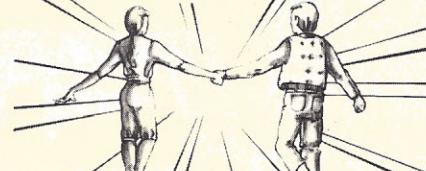
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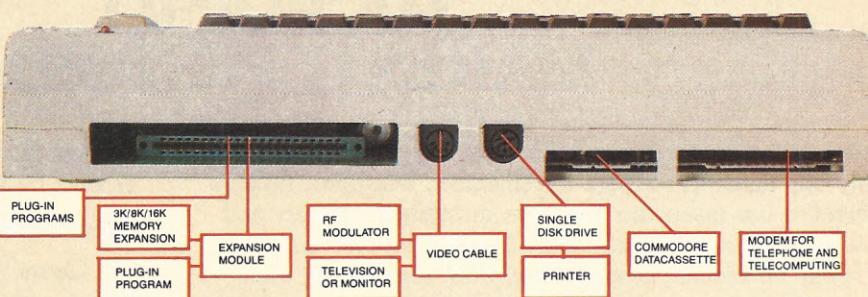


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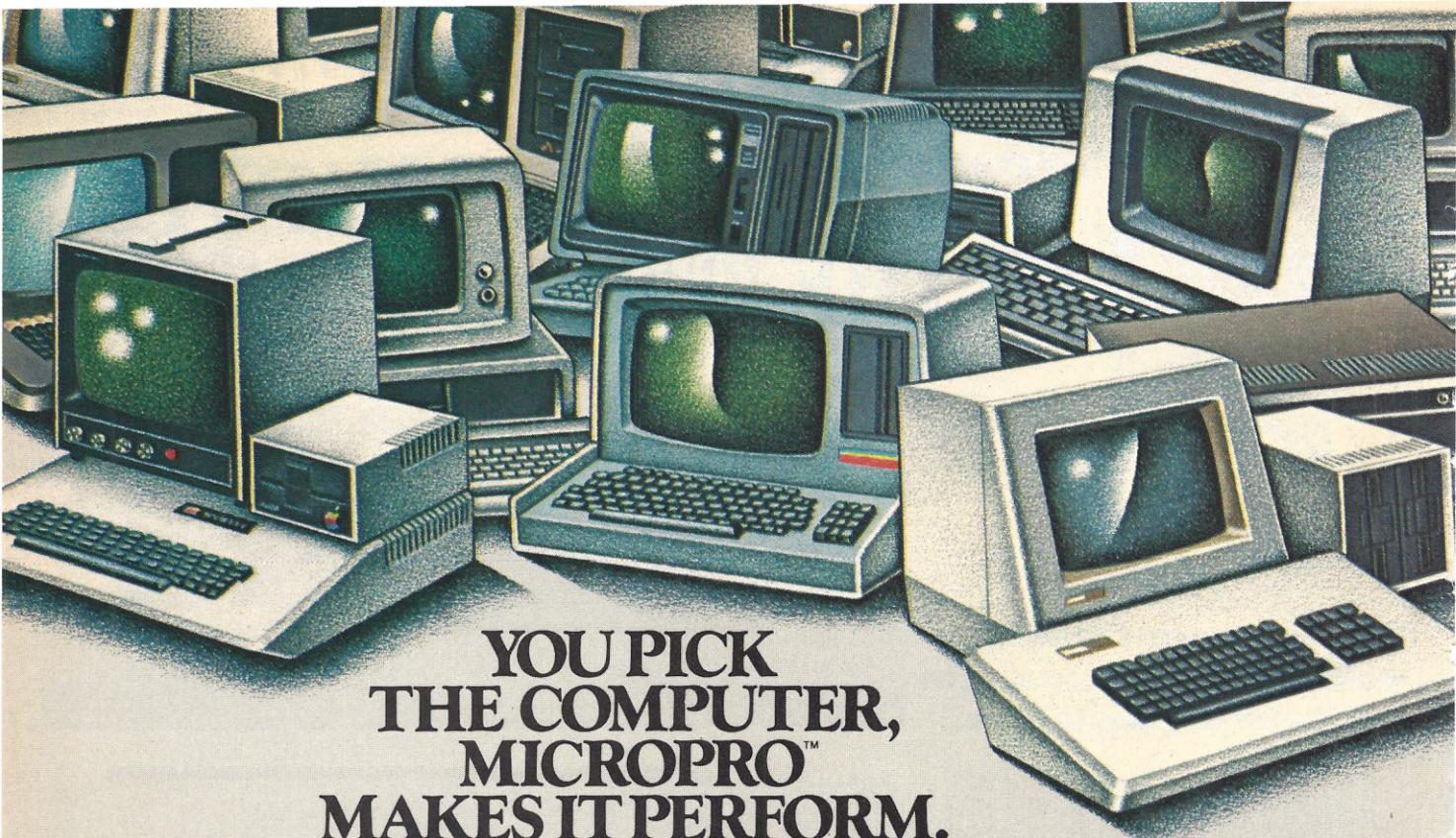
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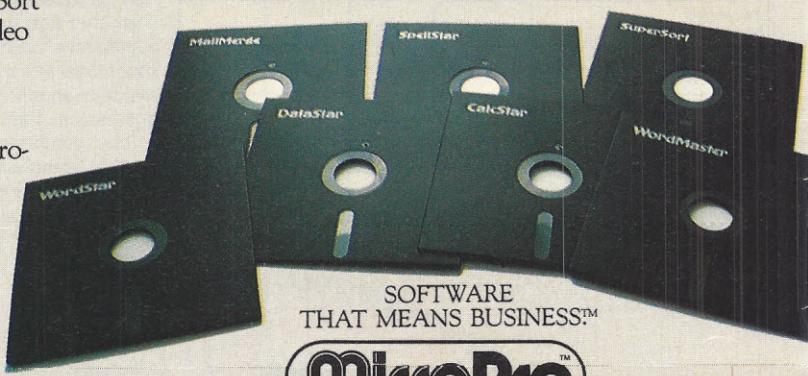
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parenthesis increases the value of LP by one. After the whole program line has been checked, Proofer compares LP and RP. If they don't match (line 710), the line in which the error appears is stored in a string array PAR\$(n), along with a note as to whether it is a left or right parenthesis that is missing. Note: If one statement is missing a left parenthesis, while another statement later in that line is missing a right parenthesis, the LP and RP will match, and the error will not be caught. This should be very rare, however.

When the end of file (EDF) marker occurs, the user is asked if results should be directed to a printer as well as to the screen. Then, if Newdos 80 2.0 is available, the array BAD\$(n) is sorted into alphabetical order. Those of you using other DOS's or sorting routines should note the easy use of this feature. It requires a single line—the CMD "O" invokes the sort. NU is specified to indicate that all NU units of the array BAD\$(n) should be sorted, beginning with element number 1. If for some reason you do not want the array sorted, even though Newdos 80 2.0 is available, simply lie to the program when asked.

The suspect words are then printed out in groups of eleven word/lines.

A counter, CU, keeps track of how many words are printed or listed. A word line combination is

displayed only if it does not equal the previous word line. If a variable or bad word appears several times in a single line, it is indicated only once. When CU can be evenly divided by 11 (line 850), the program branches to a paging subroutine at line 1010.

Once the variables and bad words are listed, the program displays all the lines that contain missing parentheses.

Proofer takes about five minutes to check an entire program. You may find that slow, but when compared to the time that may be lost proofing a program manually, the results are impressive.

A number of enhancements are possible. The program could be extended to check each variable against the keyword list, using INSTR, to see if any inadvertently included a non-allowable keyword. This would be especially helpful for those who like to use long, descriptive variable names.

Checking the spelling in a computer program is much easier than proofreading a document because the number of legal words is severely limited. Once a computer is told what words are allowed in a program, it is a simple matter to leave some of the tedious debugging to the machine. □

-DDB

Program on page 156

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Guide to Micro Correspondence Courses

by William R. Endsley, Ph.D.

There are many electronics schools that offer resident student instruction in everything from basic electronics for the housewife to full degree programs in electrical engineering. However, there are only a few schools that offer correspondence courses specifically for microcomputer users. With the burgeoning use of microcomputers for business applications, the interest in learning about micro repair and maintenance is at an all-time high. The three largest electronics correspondence schools—and most active in seeking new students—are Cleveland Institute of Electronics (Cleveland, OH), National Radio Institute (Washington, D.C.) and National Technical Schools (Los Angeles, CA).

CIE

Of the three, Cleveland Institute of Electronics (CIE) offers the most intensive and academically-oriented instruction. Twelve correspondence courses are offered. There are six at the basic electronics level for those interested in studying electronics—but who have little previous knowledge in the field or possess a weak math background. Five are available at the intermediate electronics level for those with some basic electronics and math experience. Qualified electronics technicians or specialists are offered one advanced course.

The 12 courses are offered across three content areas. The breakdown is as follows: (1) dig-

ital and microprocessor courses (including three courses at the basic electronics level); (2) technology courses (consisting of two basic, two intermediate and one advanced electronics course); (3) communication courses (comprised of one basic and three intermediate level courses).

CIE's catalog offers much information but is confusing at times when discussing the various course offerings, levels of instruction and content areas. All the courses offered count toward an Associate Science Degree in Electronics Engineering Technology. Also, there are FCC license options at the end of six courses.

All CIE instructional materials have helpful review sections interspersed throughout. The use of diagrams and photos reinforce the printed text. The primary method of examination is short-answer and fill-in. The method used on the lesson exams—which are sent in for correction—is multiple choice.

CIE includes a host of electrical test equipment. There are three electronic training labs, one multimeter, two oscilloscopes, one digital security control device, one color bar generator and one 19-in. color television. No microcomputer is offered, though. For students who are taking a microcomputer correspondence course to get good instruction—as well as obtain a microcomputer—CIE is probably not the best school to select. However, if one is interested in working for a degree and preparing for a career in

electronics coupled with an FCC certification, CIE is probably the best choice.

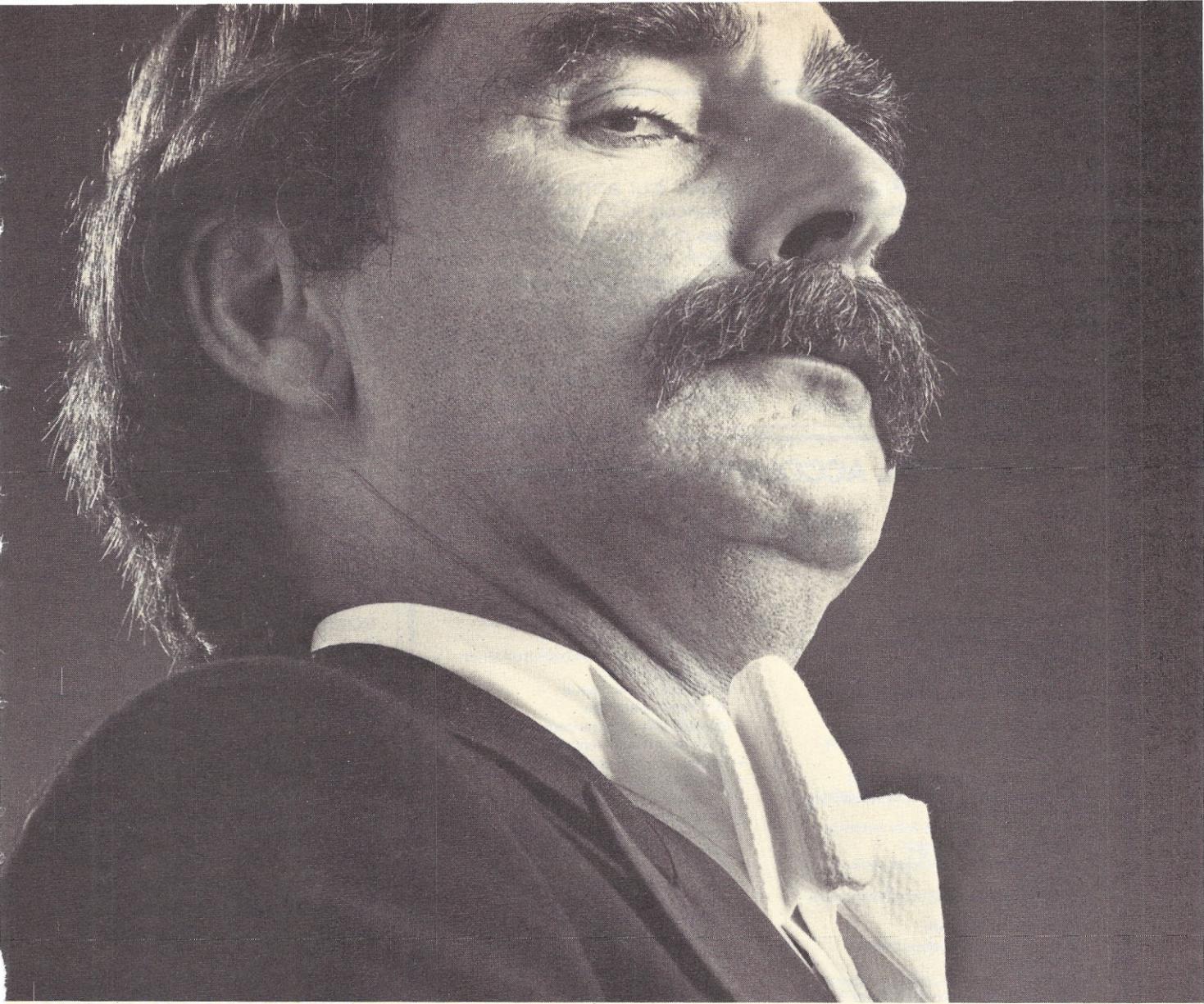
CIE emphasizes that its courses will help qualify the student for various careers in the electronics field. Certainly many CIE graduates will testify that this is true.

NRI

National Radio Institute (NRI) advertises itself as the largest and oldest radio, television and electronics school in the country. The organization also claims to have more students than any other similar school, although specific numbers of students are not mentioned in the latest catalog.

NRI offers ten correspondence courses. However the catalog lists no course distinction for students at varying levels of instruction. Evidently, all students are considered to be at the basic level when they enter. This could be viewed as a handicap to students who have a good or advanced background in electronics. NRI suggests for the beginning student to choose a course that includes Lab Training Equipment—intended to provide practical understanding of modern day circuits. NRI does not categorize course offerings into specific content areas. Each is viewed as a separate entity from the other courses.

The course variety that NRI offers is impressive. In addition to microcomputers and microprocessors, courses leading to FCC licenses in mobile, marine and aircraft communications are



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The NRI courses are geared more to repairman/technicians than engineers. No degrees are

offered, but some courses lead to various FCC licenses. Certificates are awarded upon completion of each course. (These have become well-respected in the electronics industry.)

There are self-tests at the end of each instructional unit. Like those at CIE, they are usually helpful. Likewise, there are dia-

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grams and photos complementing the text. NRI requires short answers on self-tests and multiple choice answers on lesson exams. Upon completion, the lesson exams are sent into NRI for correction and recording.

NRI, like CIE, includes several pieces of electronic test equipment as part of the course offerings. In addition, a video cassette recorder, 25-in. color television, stereo equipment and TRS-80 III microcomputer are available. Specific equipment received is contingent upon course selection. Several courses require the student to first assemble the test equipment from kits, which is then used in either building or testing the other equipment such as the VCR, T.V. and stereo. However, in the microcomputer course, the TRS-80 III comes pre-assembled. This is commendable, because the student does not have to wait for many kits to arrive one-at-a-time from the equipment manufacturer. One disadvantage, however, is that the student does not get the experience or satisfaction of assembling his own microcomputer.

NRI's course in microcomputers consists of instructional materials written by NRI instructors and content specialists. If the prospective student wants a basic microcomputer course—and a pre-assembled TRS-80 III as well—NRI is probably the best school. It has established a good reputation and its courses have a history of relevance and utility.

NTS

The courses offered by National Technical Schools (NTS) are geared more towards the technician than the engineer—similar to the courses at NRI. NTS offers courses that lead to various FCC licenses.

NTS offers 13 courses—the most of the three schools. In the micro-computers division, there are five courses offered, with two master level courses for those with advanced standing. (One advanced course is for those who

have a background in basic electronics, and the other is for those with backgrounds in both basic and digital electronics.) NTS offers these "advanced standing" courses to enable those students with good electronics backgrounds to start programs without unnecessary delays.

NTS offers no degrees, but awards completion certificates. These are as respected as those offered by NRI.

NTS has instructional materials with built-in review tests similar to those of the other two schools. NTS also uses multiple choice tests for the lesson exams that are sent in for correction. A variety of electronic test equipment is offered. It is usually assembled from a kit by the student to be used in constructing and testing various other electronic kits, including 25-in. color television, oscilloscopes and a Heathkit HN-89A microcomputer.

NTS offers a selection of three microcomputers. The type of course selected dictates the microcomputer you receive. The three choices are: SYM-1, with 1K byte of RAM expandable to 4K bytes, to be used in conjunction

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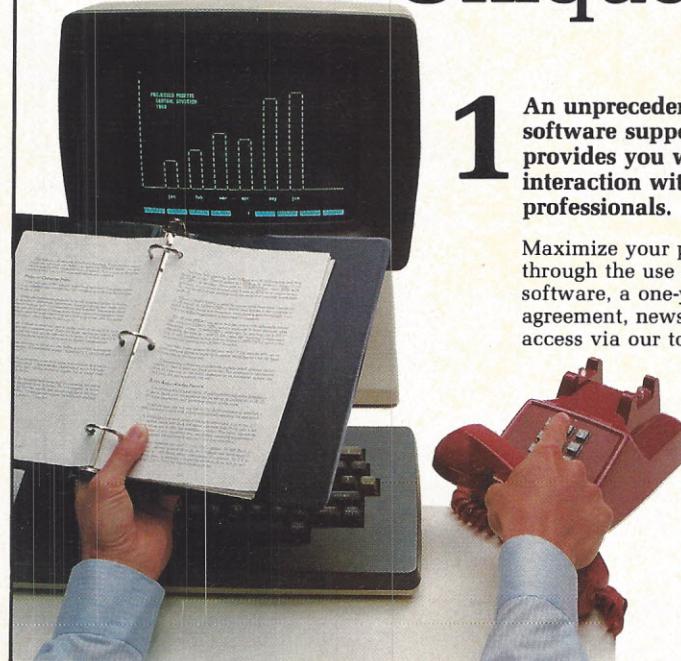
with the NTS computrainer; Rockwell Aim-65, with 4K bytes of RAM and 2K bytes of ROM, alphanumeric keyboard and a display with an integrated thermal printer; and Heathkit HN-89A with video terminal, floppy disk drive and 32K bytes of RAM expandable to

64K bytes. (Expansion of RAM on these computers is done at the student's expense.) All three are built by the student.

NTS's instructional materials in all of its microcomputer courses consist of a combination of text written by the staff and appropriate supplemental paperback books written by well-known authorities. The combination results in a strong and varied understanding of the construction and operation of computers. If the prospective student desires to take one of any of five exceptional microcomputer courses—plus receive a microcomputer to build—NTS is probably the best correspondence school to select.

All correspondence schools offer various payment plans to better accommodate students with differing financial positions. Each school usually has a VA reimbursement plan for veterans who have served for continuous

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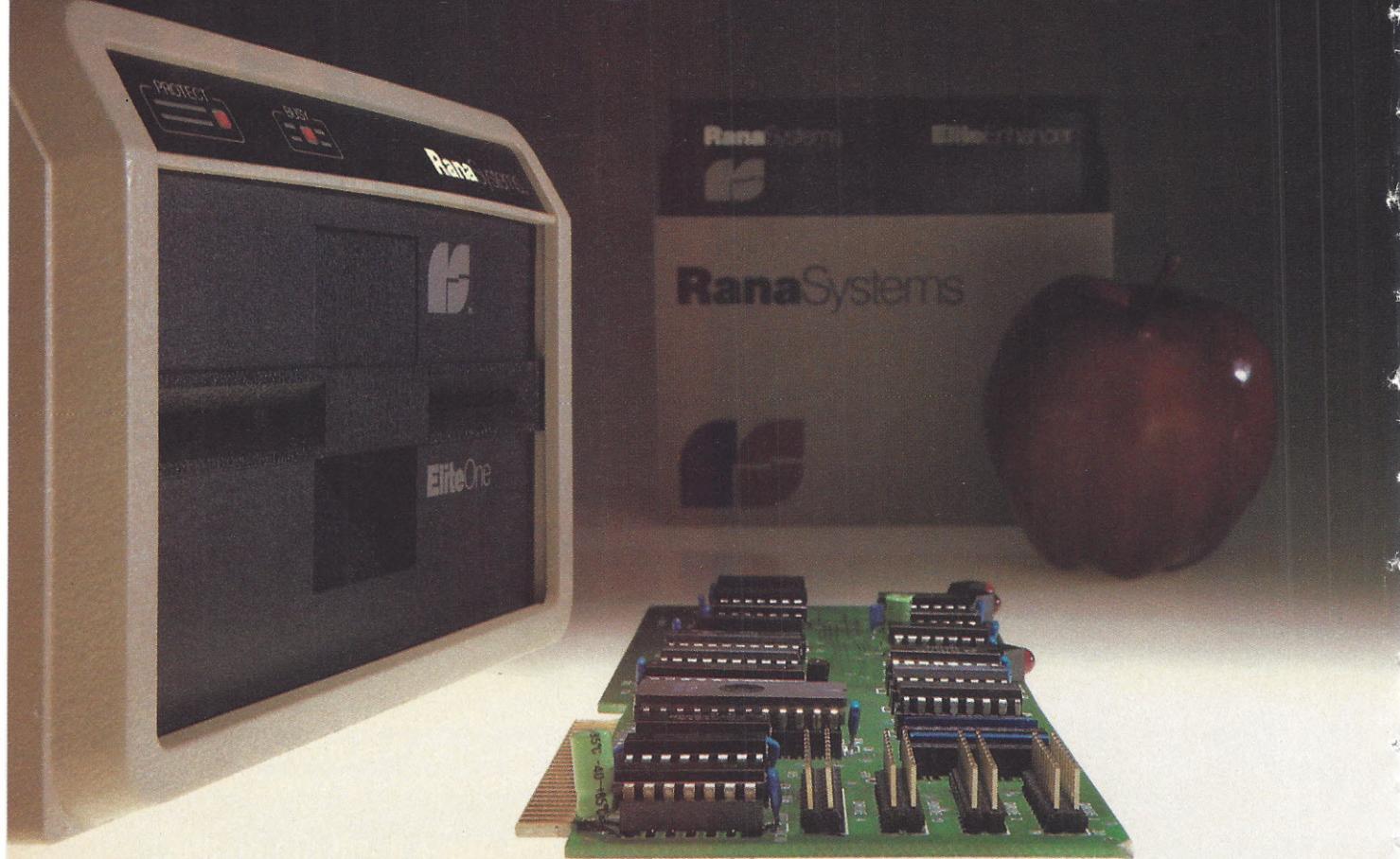


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AUGUST 1982

military service of at least 181 days and completed this service before January 1, 1977. Other VA plans are available for those presently in the service.

All three schools use multiple choice as a primary testing method for lesson exams. Upon completion of each exam, the student fills out a form that is sent back to the school for correction and recording. All of the schools strive to correct each exam and return it to the student as soon as possible. This method can be ineffective since most students will proceed to new materials without being sure they learned what they should have out of the previous instructional materials. It would be worthwhile for all correspondence schools to develop some sort of latent image (instant response feedback) testing procedures. In this way, correspondence students would have more expedient feedback on exams before they are sent back to the school for recording only—not correcting and recording.

All correspondence schools have some sort of consultation form for the student to fill out and send in when a specific problem with the instructional materials or exams arises. Again, this is inefficient. Many students get frustrated at the inefficiency and end up calling the school directly for help. Most are not staffed with full-time technical experts who sit anxiously awaiting calls from perplexed students. The problem will go away only if the correspondence schools employ full-time technical staffs to handle problems over the phone. These changes may take a while to implement, however, due to budgetary limitations at most of the schools.

Before dismissing the topic of multiple choice testing, a discussion of the different methods used by the three correspondence schools will give the student a better perspective. One method used by CIE and NRI consists of asking multiple choice questions for the student to answer. The stu-

dent has the option of reviewing the instructional materials before selecting the appropriate answer, but the answer must be derived by the student. The other method of multiple choice testing requires the student to either recall, recognize or look the answer up word-for-word in the instructional text. There are proponents who support both kinds of testing, although it is generally conceded that the derived multiple choice answers are harder for the student to successfully complete. Simply stated, the student is required to take more time considering the exam answers. This does not mean that the student will benefit more from this type of exam; it only means he will have more difficulty completing the derived exam than the word-for-word exam. Both testing formats are essentially open-book multiple choice exams.

One item to consider in regard to kit assembly is the fact that equipment manufacturers are occasionally caught without adequate supplies. Most manufacturers require a lead time of 30 to 40 weeks before delivery on large orders of equipment. Most correspondence schools order from the manufacturers not on a one-by-one basis, but on a weekly, bimonthly or even monthly basis—depending upon the type of equipment. Sometimes it is difficult to obtain an adequate flow of equipment to satisfy the needs of all students. A factor that recently curtailed the delivery of Heathkit microcomputers was a problem concerning radio frequency interference (RFI). The problem has been solved, and the ripple effect it had on correspondence schools (namely NTS) is now greatly reduced. □

Dr. William R. Endsley is the Director of Marketing Support for EMCCO, Inc. (Educational Management Consulting and Curriculum Organization, Sedona, AZ). He works with instructional courseware development and marketing for video-based computer systems.

INTERFACE AGE 51



Commodore
'B' and 'BX' Series
Professional System

New Commodore Line

by Mike Heck

With the announcement of a new series of personal and professional microcomputers, Commodore (Wayne, PA) has changed the scope of its entire product line to target more closely into specific application areas. This revamping was initiated with the introduction of the Max machine and Commodore-64 earlier this year ("Commodore Logbook" /A May 82).

The newly-announced products could best be thought of as falling into three separate series—each directed at a different market, but with some necessary overlap. Each series is suitable for a particular area of user application—personal use, business use, and advanced business use. The major difference between models within a series is in memory configurations.

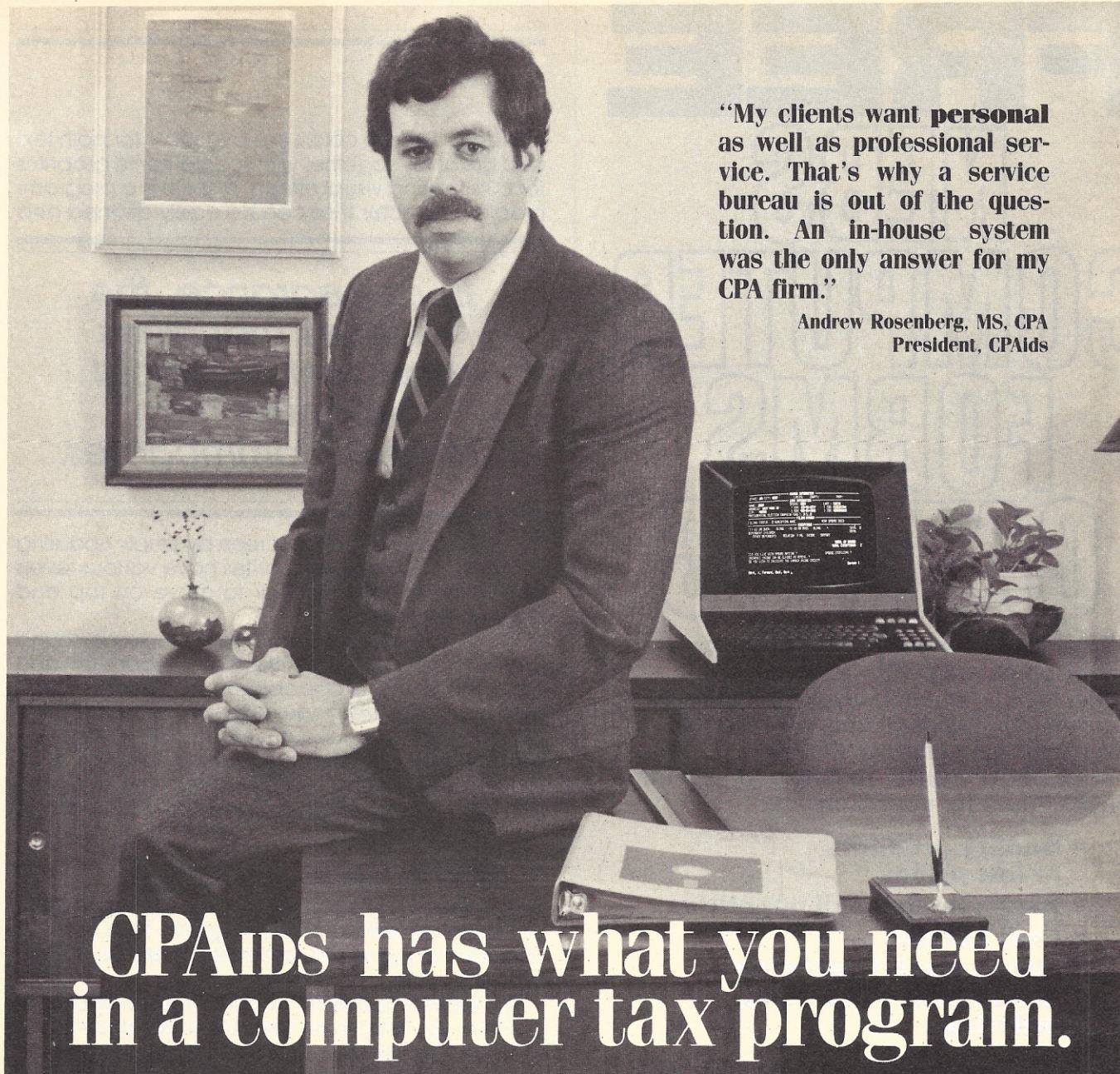
Three Application Categories in

'P' Series (Personal)

The 'P' series is a software compatible range of color computers starting at 128,000 characters of user memory and expandable up to 512K bytes. Physically, the series is a self-contained single unit with integral keyboard. These systems are designed to be used with a separate color monitor, or TV via the built-in RF modulator. 'P' series computers are compatible with existing CBM peripherals using the IEEE-488 bus.

The basic microprocessor is a 6509, which is an 8-bit model with extended addressing to handle the larger memory and other system requirements. Additional processors can be added for using other operating systems. For example, a Z80 board permits users to access the vast library of CP/M offerings.

The display circuit used in the 'P' machines is the same as used in the Commodore-64, and provides a text display of 40 columns by 25 lines. In addition, a high resolution display of 320 by 200 dots is



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INTERFACE AGE 53

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In appearance, the 'B' Series machines represent a radical departure from previous Commodores.

moved anywhere on the screen by simply updating its X and Y coordinates. Sprites have various levels of priority, so they appear to move on top and behind each other.

The 'P' machines also contain the same sound synthesis chip used in the Commodore-64 and Max. This circuit is capable of producing sounds over a nine-octave range and gives users complete control over the sound envelope. This means you can simulate just about any sound faithfully, from musical instruments to special effects. The keyboard is identical in operation and features to that on the next series.

'B' Series (Business)

The 'B' series is a software-compatible range of professional computers starting with 128K bytes of user memory and expandable in various configurations up to 512K bytes.

This series features an attached green phosphor monitor; the standard display is 80 columns by 25 lines. Optionally, a high resolution graphic enhancement allows the creation and display of super-dense graphics. Like the 'P' machines, the 'B' series can use the full line of CBM peripherals for easy expansion.

In appearance, the 'B' machines are a radical departure from anything Commodore has ever produced. Following the current trend toward ergonomic design, the attached monitor can be adjusted to a comfortable viewing angle. The display is a high-definition type, producing exceptional text clarity and graphic resolution.

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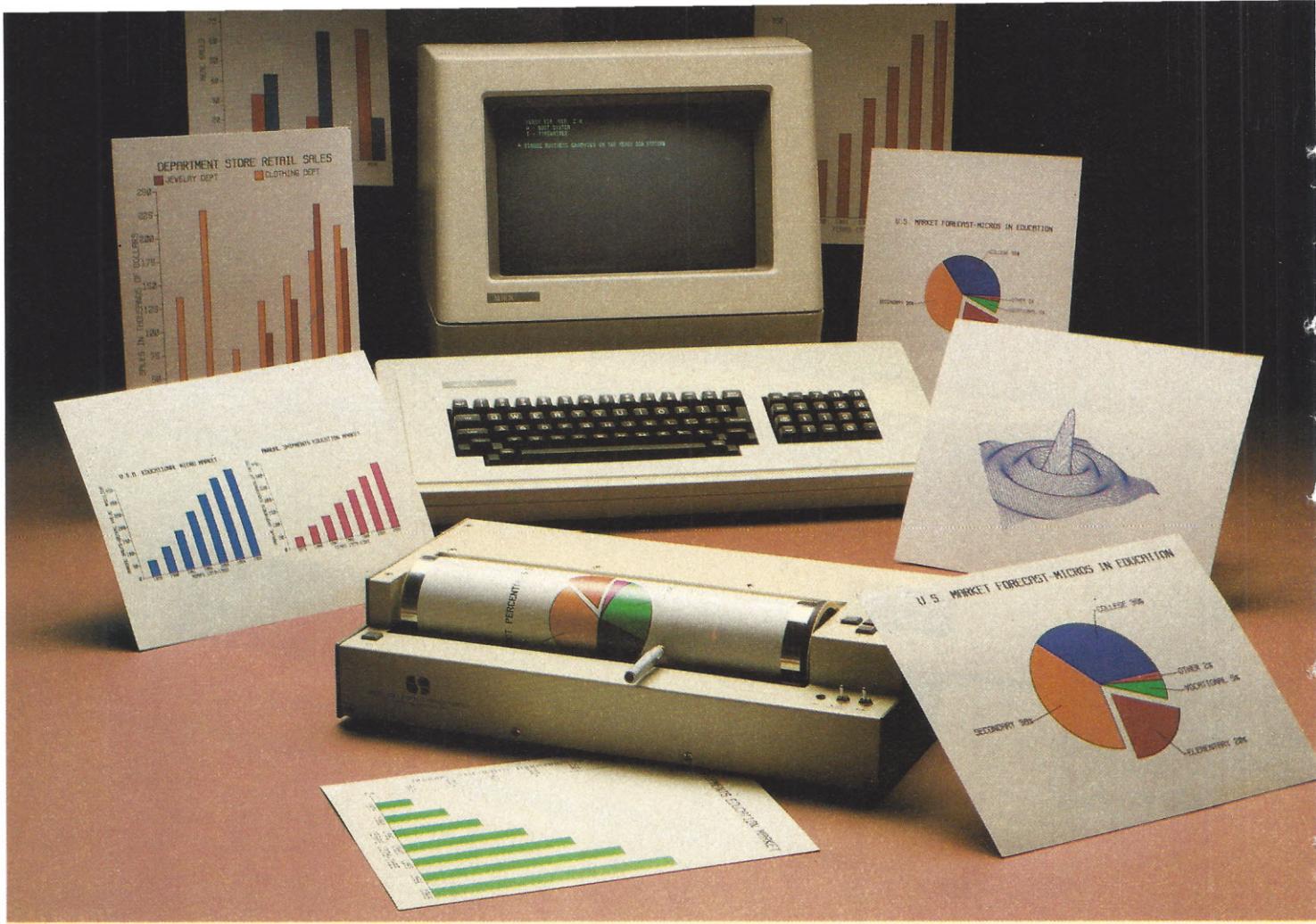
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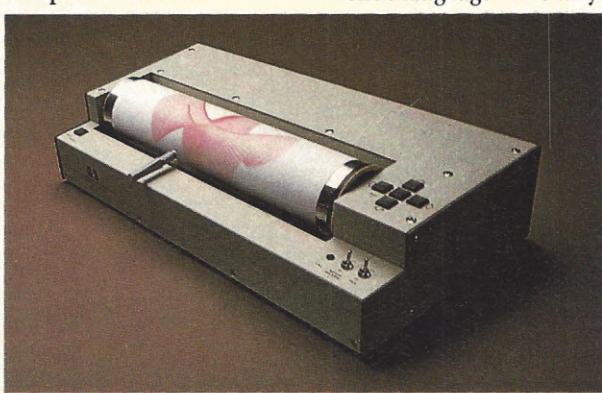


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The 'B' series can accept up to two integral disk drives. These are connected via an internal high-speed interface for high data transfer rates.

'BX' Series (Advanced business use)

The 'BX' series is an enhanced version of the 'B' series, with 256K bytes of user memory, and a second processor—a 16-bit 8088—also included as standard. The 'BX' series is software-compatible with the 'B' series. In addition, the 8088 processor allows users to access the existing library of CP/M-86 programs. In all other ways, the 'BX' series is physically and functionally the same as the 'B' series.

This new generation of Commodore microcomputers share many common features. These include items that have always been part of the Commodore line, such as the IEEE-488 information interface bus

All three series have enhanced memory expansion and the facility to accommodate a second microprocessor.

(used for attaching disks and printers), real-time clock, the Pet graphic set (a set of 64 graphic symbols that can be typed from the keyboard) and the broadly compatible Commodore Basic language.

New features include an RS-232 interface for communication with other systems via a modem, or for connecting standard printers or other accessories directly.

All three series have enhanced memory expansion up to 512,000 characters of user memory, and the facility to accommodate a second microprocessor—thus creating a multiprocessor computer system. An optional Z80 processor board offers CP/M capability and is available across the entire new product line.

The unique Commodore music synthesizer chip is included across the product line, as well as a cartridge software slot that facilitates instant plug-in application and game software. Also included are two control ports for joysticks, paddles and other peripherals.

The primary language across all series is Commodore Basic 4.0. It is upwardly compatible with all Commodore products, starting with the original Pet. This Basic is an enhanced version of the popular Microsoft Basic. U.S.C.D. Pascal will also be supported, along with a number of other high-level languages.

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with existing software. In fact, these machines may be configured in so many ways internally that all existing programs designed for earlier Commodore systems will run without modification. An earlier version of Basic can be loaded, tricking the system into thinking it is an earlier Pet, for example.

A special feature of these computers is the ability to handle a second co-processor in addition to Com-

Besides communication with modems, these machines can be directly linked using a three-wire networking scheme.

modore's own 6509 microprocessor. These supplementary processors can operate at extremely high speeds by working in conjunction with the main 6509. This is made possible by special system management software built into the operating system.

These revamped systems support the full range of Commodore CBM peripherals via the built-in IEEE-488 interface. Any standard CBM peripheral can be used.

In keeping up with current business needs, data communication capability was given top priority in the new machines. Users have the option to attach a standard modem via the built-in RS-232 interface or use an IEEE-488 modem connected to the IEEE port. Besides long distance communication with modems over phone lines, these machines can be directly connected using a low-cost three-wire networking scheme.

Commodore intends to continue production of the current line of Pet and CBM products as long as there is demand, so there seems to be a plan for a smooth transition. □

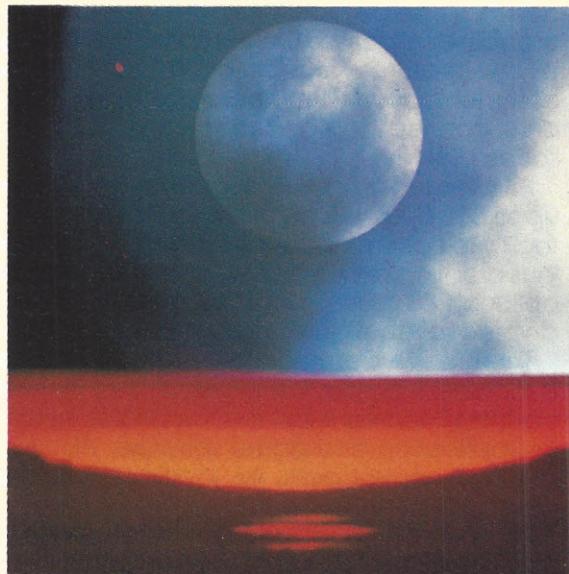
Mike Heck has been involved with the computer industry for 15 years, having worked for both mainframe and microcomputer manufacturers. He was one of the founders of the Philadelphia Apple Users Club. Mike recently wrote the user manual for the Commodore-64 and also serves as a test site operator for a number of manufacturers in the microcomputer industry.

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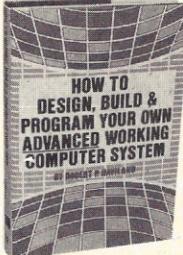
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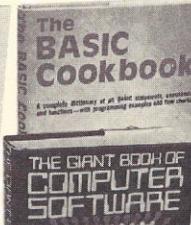
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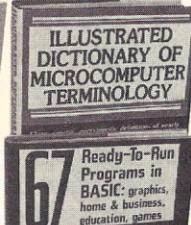
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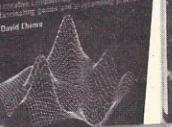
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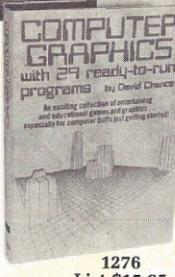
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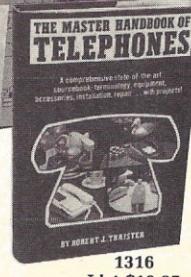
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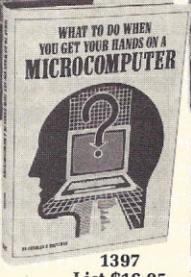
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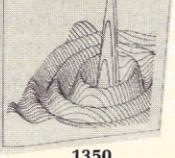
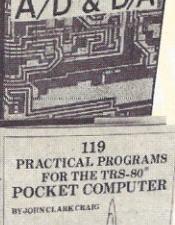
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IMPLEMENTATION

How to Evaluate Documentation Manuals

Frequently, microcomputers are permanently shelved because of poor user manuals. Often, the buyer can't decipher poorly written, inadequate or disorganized instructions.

Because few dealers can afford to provide hours of personalized instruction on the use of their equipment and programs, documentation plays an important role in the selection of a system. It is perhaps second only to the quality of programs available. Fortunately, the consumer can easily evaluate a number of aspects of documentation to determine relative quality.

There are basically three types of documentation: systems manuals, user manuals and operator manuals: Systems manuals describe how an entire system works; for example, a general ledger system. It describes the purpose and the relationships between different parts of the programs (routines). The flow of the system is spelled out and data formats defined. The function, purpose and logic of the system, as well as an overview of operation are included. User manuals describe what information is entered, how output reports are formatted, and what a particular application will do. Operator manuals describe how to operate the equipment and programs.

Self-instruction requires good documentation. The manuals should clearly teach use of the computer, the peripheral devices and programs.

by Linda Gail Christie

Different levels of computer expertise should be addressed by the depth and organization of the manuals. For example, a beginner needs detailed instruction, while an experienced operator may want a quickly referenced definition of a code. Following are questions you should ask to determine whether or not a manual fulfills its basic functions.

What level of computer expertise is needed to read the manual? The manual should be written for the audience using the equipment and programs. Examine the manual to determine if a large amount of jargon is used. Does the reader have to know



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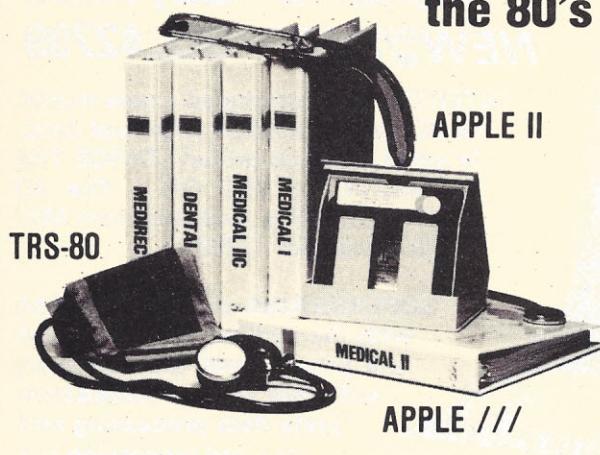
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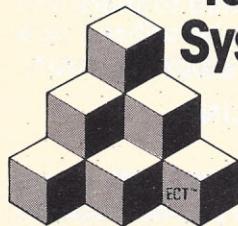


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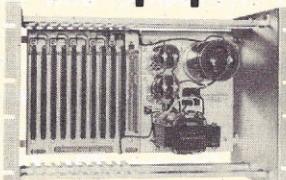
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computer terminology to understand the manual? Is the detail sufficient for a novice to perform each step and get the system to operate? Or does the manual assume the operator knows where buttons are located, what terms like "boot" and "load" mean, and what a floppy disk is?

What language level is used? Are the words short and common? Are sentences simple and under 17 words? If jargon and multiple syllable words are frequent, the manual might be difficult to follow.

The manual should give an overview before jumping into detailed steps.

Also, if sentences have more than two commas in them, they are too complex for the typical reader. Does the manual give an overview before jumping directly into detailed steps? Such a preface prepares the reader for what is coming and provides a transition from the previous topic.

Is the manual organized and easily referenced? Is the printing legible? Are the letters in upper and lower case? Are key words, symbols and sentences highlighted with underlining, caps or italics? Sub-headings should be used to help with organization and data search. The manual should be professional-looking from front to back.

Is the organization clear and easy to follow? Does the writer express the information in a direct sequence? Can you follow the logic? Procedural steps should be presented in proper order. Sentences like "push the button and type Q" are better than "type Q after pushing the button." Reference pages should direct the reader quickly to a specific piece of information. An index, glossary and table of contents should have sufficient detail to be useful. Large manuals should have index tabs to locate major sections.

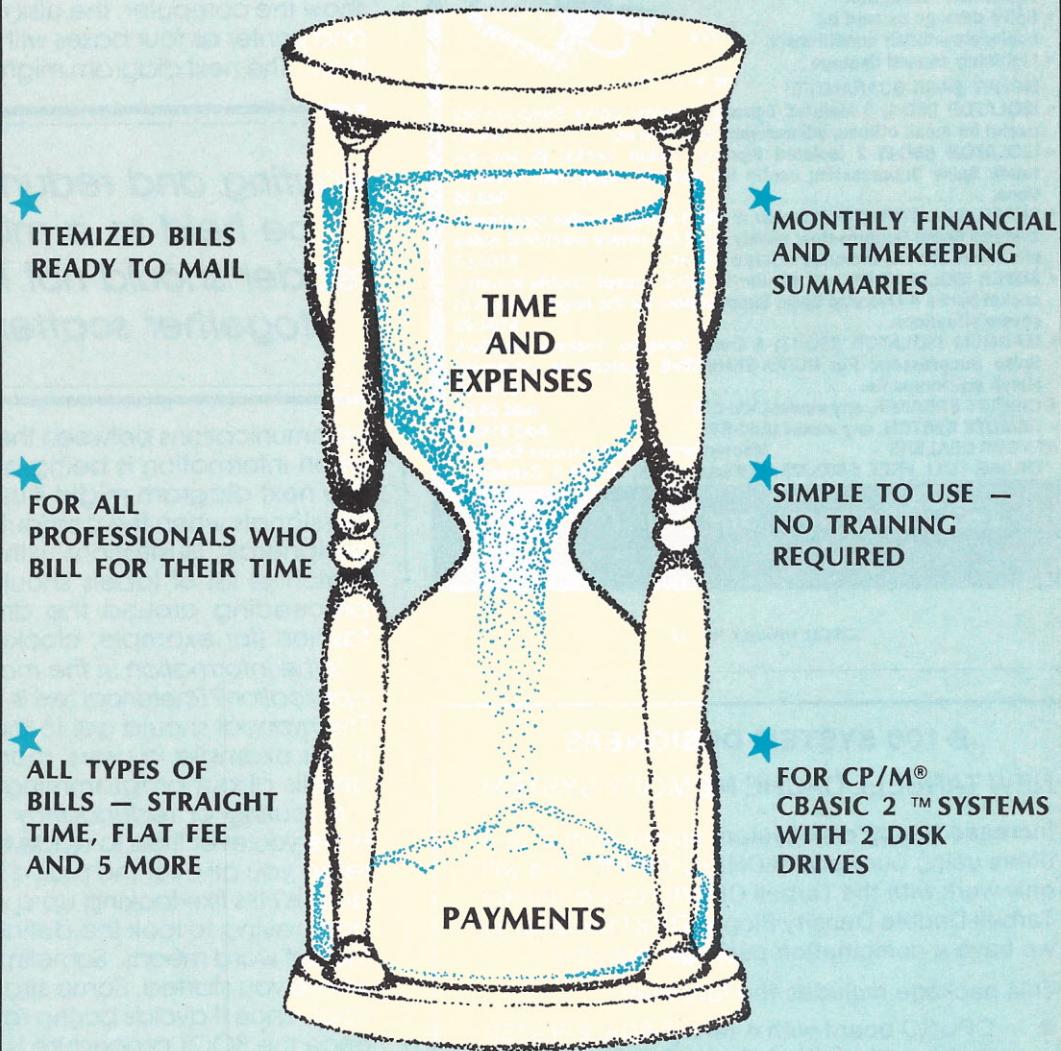
Does the documentation have summary lists? Commands and error codes need to be looked up frequently by the novice. How do you tell the computer to print your text? How do you tell the computer to double space? What does "ERROR #5" mean? And, what do you do to fix it? A neatly referenced manual will direct the user quickly to the answers needed to proceed with the operation.

Are the illustrations helpful? Illustrations should progress from simple to complex. In that progression, the configuration should not change on the page. For example, if the printer is represented with a box

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on the left side of the diagram in the first figure, it should not be a circle on the right side in the next.

Each successive diagram should break down into more detail. For example, the first diagram might show the computer, the disk drive unit, the terminal and printer as four boxes with lines drawn between them. The next diagram might show the direction of

Routing and redundancy should be held to a minimum; the reader should not have to piece together scattered details.

communications between the CPU and peripherals when information is being put into the computer. The next diagram might illustrate the direction of the signals when the computer is outputting to the peripherals. Illustrations with numbers keyed to a matched list of labels should have the numbers proceeding around the drawing in an orderly fashion (for example, clockwise).

Is the information in the manual relevant to your application? Rhetorical text is boring and confusing. The manual should get to the point and stick with it. For example, a users' manual should not have details about programming.

Is routing or redundancy held to a minimum? Have you ever tried to wade through a manual that refers you all over the place to piece together the details? It's like looking up a word in the dictionary and having to look the definition up to know what the first word means. Sometimes it's difficult to know where you started. Some strategic routing is beneficial, since it avoids boring repetition. For example, once the BOOT procedure is spelled out, it should not be repeated every time the word appears. However, it might be helpful if beside the word it said "(Details on page 6)." This allows the uncertain user to thumb back for a refresher as needed.

Is the technical quality good? Does the manual do what it claims to do? Is the big picture presented first, then followed by the details? Answers to questions should be explained to the proper depth. Definitions and explanations should be clear and should work. □

Linda Gail Christie is a management consultant with Team Associates, Inc., (Tulsa, OK). She is also owner/manager of A.M.S., an outdoor power product sales and service business, and a freelance writer/photographer. She holds an M.A. in Industrial Psychology from the University of Tulsa. Over 20 of her business and computing articles have been published in various magazines, and her first two books will soon be released by Prentice-Hall.

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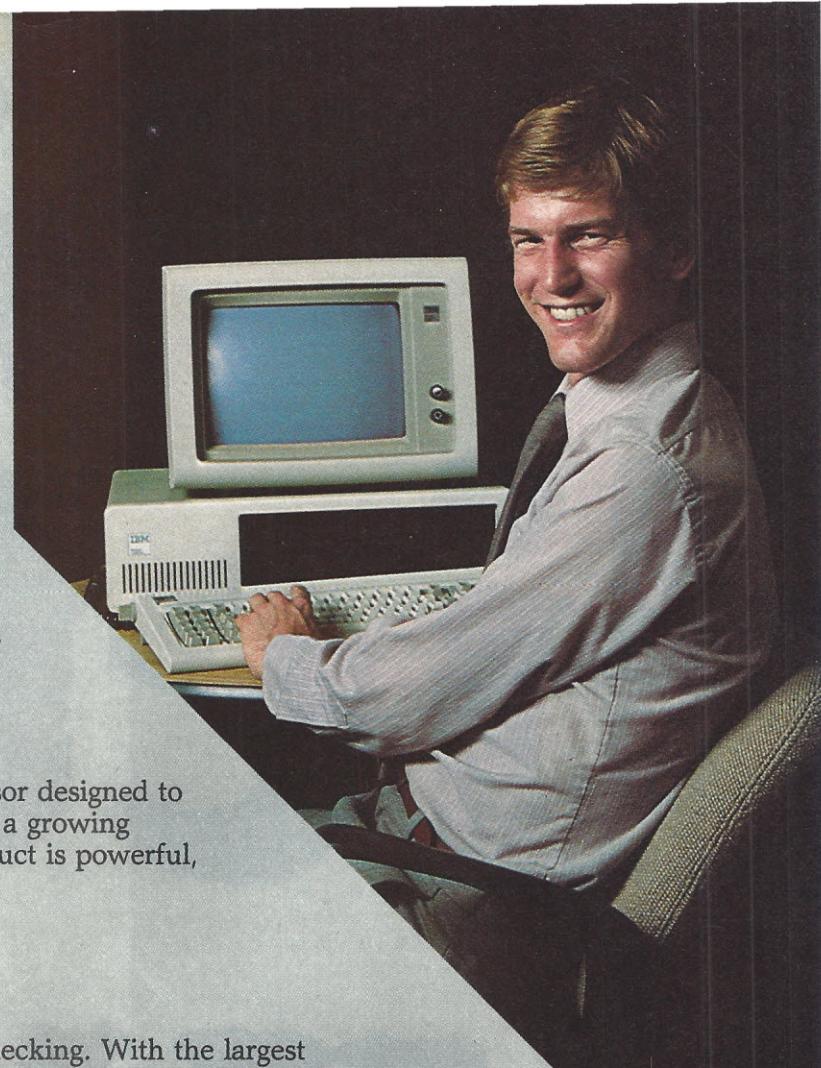


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REVIEW

VOCABULARY

DICTIONARY

WORD

Dictionary Software

by David D. Busch

adult easy book

The most sophisticated word processing systems of today are already yielding to the information processing of the future. Within a short time, you will be able to compose and edit text, check for grammar and spelling errors and consult a variety of references from a single piece of software. Your terminal will—at your command—offer synonyms, definitions or quotations. Programs like Grammatik (Aspen Software, Tijeras, NM) and Thesaurus (Refware, Chappaqua, NY) provide a glimpse of this information processing potential.

Grammatik

We tested the version of Grammatik written for the TRS-80 models I, II and III. (The CP/M edition was reviewed in *I/A* May 82.) A disk system and either 32K or 48K bytes of user memory are necessary.

Grammatik works very much as a spelling checking program, but with an important difference. Spellers compare each word in a document against various dictionaries, either built-in, user-supplied or user-enhanced. Any word not found is considered a possible misspelled word.

VOCABULARY DICTIONARY TEXTOR DOC

Grammatik, on the other hand, accesses several "dictionaries" of errors, poor usage and troublesome phrases. Questionable material is flagged for operator attention. A spelling checker can "approve" only a finite number of words, while spotting an infinite number of possible misspellings. The opposite is true of Grammatik. Only errors that fit the program's parameters (or that have been added by the user) will be caught. Because it is incapable of understanding the meaning of the sentences, many errors, such as subject-verb agreement, are invisible to it.

Even so, Grammatik is a useful tool. The more the program is used, the less it is needed. Once the writer has an often-repeated error called to his attention, there is a tendency to avoid that usage next time.

I was disappointed at first to discover that Grammatik was able to find very few errors in samples of my own writing. However, of the errors Grammatik did flag, several were repeated as many as a dozen times in a single document. (These were generally slightly wordy phrases, such as "one of.") After a few sessions with Grammatik, I found that the types of errors flagged disappeared from my writing. It would seem that an excellent application for this program would be to teach English grammar. Student compositions and essays could be processed by the program, and many blatant errors would be quickly discovered.

Even those with excellent grammar frequently make typographical errors. Grammatik is especially

good at finding missing parentheses and quotation marks, improper capitalization, doubled words and punctuation and other typographical errors. This program should be used in conjunction with a spelling checker program, because it expects to find all the words correctly spelled. It will not flag "in conjunction with" as an awkward phrase unless "conjunction" is spelled properly. Moreover, Grammatik manages to serve as an additional spelling aid, because it looks for matches rather than exceptions. Spellers will not flag "can not" because both "can" and "not" are valid words. This program, however, lists the pair in its dictionary of no-no's.

To begin, the operator loads the program, GMK, and any dictionaries that will be used into memory. The main phrases dictionary includes about 500 phrases and suggested alternatives. You may also load the "sexist words" dictionary and any you may have compiled on your own into memory.

The amount of available memory is limited to about 800 phrases and suggested revisions. However, Grammatik allows much flexibility in use. You may opt to load only phrases, and not suggested replacements—freeing some memory. It is also possible to not load a dictionary that may not be applicable, and substitute others.

For example, I have put a great deal of study into sexist phrases and terminology, and I never, ever use such terms. So, I can skip using the SEXIST/GMK file for my own work. Those using that dictionary should find that the incidence of sexist terms in their own writing will decrease with frequent use of Grammatik.



There is no reason a document could not be checked twice, with different sets of dictionaries, if many phrases are being used or the operator has a 32K-byte machine.

A menu provides a list of choices. The file to be checked can be entered, dictionaries loaded, and various checking and output options noted. This mode works very well for beginners, who can step through the process. One-drive users are prompted to load disks containing each of the needed files. The advanced user can build a configuration file containing the parameters to be used and skip the menu entirely. Grammatik can be invoked by typing GMK filename/ext, for automatic operation.

The program displays errors on the screen and may be ordered to save a marked output file with each error flagged with a "#." Any word processor's global search function can be used to locate these markers for later revision.

Because the provided dictionaries and those built by the user are ordinary ASCII files, they may be edited at will. A sorting program is provided that arranges phrases in alphabetical order for easier manual searches.

You may build your own dictionary with your word processing program. Technical phrases, jargon, abbreviations and other items (along with your own preferred substitutions for given errors) may be specified. The process is simple and requires no special software.

In addition to spotting grammatical mistakes, Grammatik will count the number of words and sentences, measure them and tell you average word and sentence length. Other characteristics of the text, such as longest sentence and number of questions asked are also tallied. An additional module, Profile, prepares a list of all words in the text, grouped by frequency.

The prices are \$59 (model I or III), \$99 (model II) and \$149 (CP/M 2.2).

Thesaurus

Thesaurus is one of the first of the reference work programs that will eventually be accessible without leaving the word processing program. Because it is currently lacking that capability, the program will not be used frequently by writers up against a deadline.

It consists of three modules, Thesaurus: Nouns, Thesaurus: Adjectives and Thesaurus: Builder.

The programs are virtually self-documenting: several frames appear at the beginning of each RUN, which explain how to operate the module. While these frames are helpful, they can be a bit annoying to the expert user, who must page through each time to begin operation. If there is any way

to bypass this step, I did not find it in the program or the documentation. It is also not possible for the user to list or modify any of the programs.

The instructional frames are also reproduced in the documentation—one to a page—with additional explanatory information. The instructions for adjectives and nouns are almost identical.

Two modes of operation are available. The user may request a list and the program will simply offer all the synonyms in its database. The user can then scan through to find one that seems appropriate. As with any thesaurus, many of the words offered will be inappropriate, while others will be closer to what is desired. With luck, the exact word you need will appear before long.

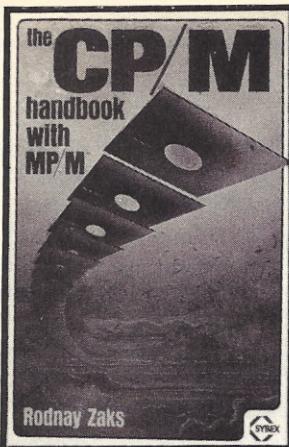
The program will also allow the user to enter a sentence using the desired word, and will then substitute alternative adjectives or nouns in the sentence. This mode is especially useful when the writer is trying for a particular mood or subtle meaning, and wants to see how a word looks in context. Thesaurus has a fairly complete word list—about 5,000 of each type—and can be expanded through the Builder program.

I have some doubts about how frequently a non-fiction writer would use such a program. Professional journalists generally stick with words they know. Short sentences and simple words are more readable. Checking a reference work is a more common practice for novelists or creative writers.

To use the program, it is necessary to store or save the document being worked on, exit the word processing program, enter Basic, load Thesaurus, page through the instructions and finally begin running the program. While the searching process is fast, it does take some time. I found that I can grab a conventional thesaurus and leaf through to find an entry in a fraction of the time it takes to use the program. It is a novelty that I enjoyed using a few times. If I were a heavy thesaurus user, I think I would find it a bit tedious. This program may also be better-suited as a teaching aid than as a reference work for writers.

Nevertheless, Thesaurus is one of the pioneering reference tool programs. Imagine hitting a special function "synonym" key and having a choice of words squirt in and out of your document in full context. The day will come soon enough. In the meantime, this program gives us a taste of what's in store. □

Contributing editor David D. Busch has written more than 200 articles on computers, applications and word processing. His profiles of mainframe and minicomputer installations have appeared in many computer trade publications. In the past two years, he has devoted special attention to personal and small business computers, as a programmer, reporter and observer.



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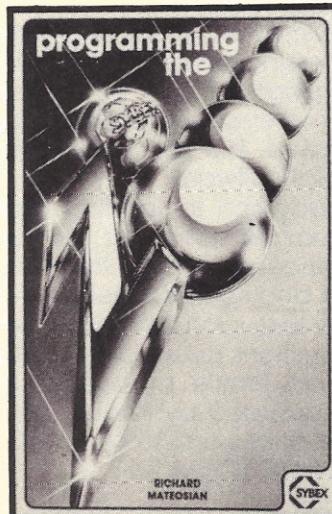
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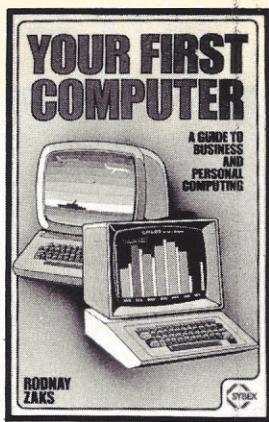
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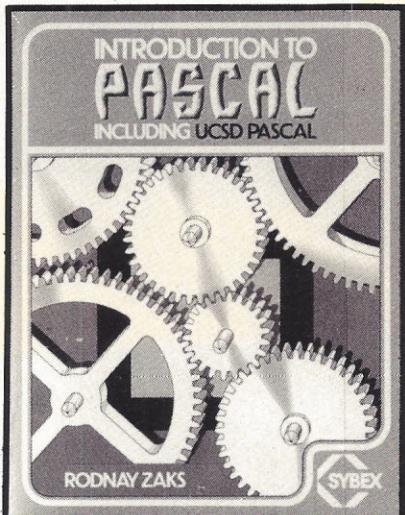
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REVIEW



System of the Month

Alpha Micro AM-1000

by Tom Fox

There's something new from Alpha Micro (Irvine, CA): a mid-range micro with some innovative directions for business users. Traditionally resident at the top of the micro-computer field—both in terms of price and performance—this manufacturer is breaking new ground with its under-\$10,000 AM-1000 two-user system.

For openers, the AM-1000 is *not* an S-100 bus computer, its CPU *not* based on the Western Digital WD-16 microcomputer chip (close cousin to Digital Equipment Corp.'s LSI-11 device). Further, the AM-1000 is *not* designed for use with large, multi-Megabyte disk drives, and will *not* be comfortable with a dozen or more terminals and printers attached. In all of these respects, the AM-1000 differs significantly from earlier products.

In concept, it's closer in design to some of today's familiar single-board microcomputers, but brings several new concepts to that class of machine. The ability to read and write computer data with a low-cost home video cassette recorder is one example. The AM-1000 is also one of the first to reach the market packed with the impressive Motorola-designed 16/32-bit MC68000 microprocessor as its main computing engine. Another rarity in this price range is AMOS, the sophisticated multi-tasking operating system that the company has been refining over the last five years on its line of 16-bit business microcomputers. It has been said, in fact, that the AM-1000 was designed specifically to be a low-cost vehicle for AMOS and the collection of programs it has accumulated during this period.

The packaging of the AM-1000 is a radical departure from earlier Alpha Micro designs, although the new computer takes a form that will be quite familiar to many of today's



micro owners. The main unit is an oblong, desktop mounted box with a strong visual resemblance to the IBM Personal Computer. It's just 5-in. high, and takes up 15-in. by 18-in. of desktop space. The flat top is uncluttered by air vents or other impediments;

The system differs significantly from earlier products by this company . . .

it seems a natural place to perch the video display portion of a detached-keyboard display terminal.

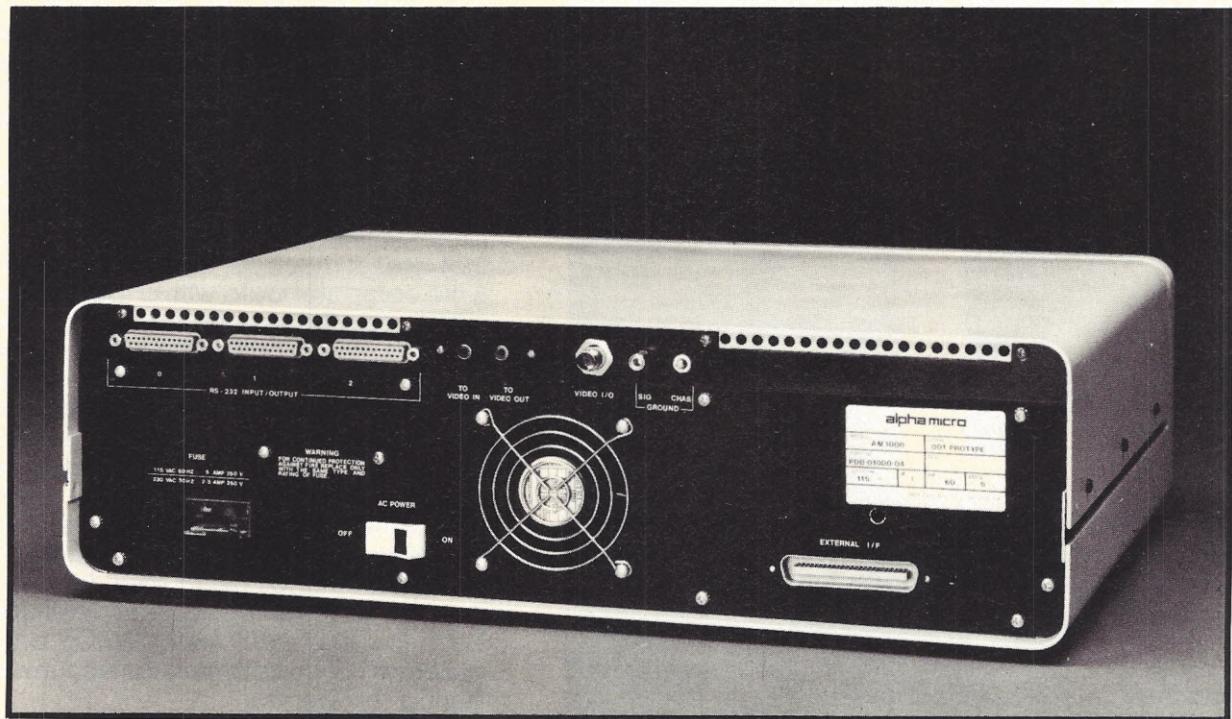
The front panel is dominated by an opening just large enough to contain a pair of 5½-in. disk drives. These can be either one or two minifloppy units, a single Winchester hard disk or a combination of both. The various sub-models of the AM-1000 are

largely defined by the permutations of these disk drives. If one or both of the drives are of the floppy variety, the user is faced with one or two horizontal slot(s) for the insertion of diskettes.

A small area occupying the right-hand quarter of the machine's front panel contains nearly all of the available manual controls and indicators. The relative complexity of the panel functions gives a clue to the sophistication of the processor lurking just behind. A push-button SYSTEM RESET key causes a cold bootup sequence. Just below are three small illuminated indicators: a POWER lamp, a RUN light and a PARITY ERROR warning. The RUN light glows whenever the main processor is running (essentially all of the time, given the timesharing character of the operating system). The PARITY ERROR lamp has to do with the internal data-checking of the system's memory; it should light up only under the rarest of circumstances.

The STATUS indicator is a large two-digit display, each forming one of the 16 Hexadecimal characters (0-9 or A-F). The Alpha Micro-supplied software uses this display to announce the details of possible errors during system boot-up, but a Basic applications programmer can make them show any useful message.

The rear panel of the AM-1000 contains a dual-voltage power receptacle (to American or European standards) and lighted AC POWER rocker switch. A



AM-1000 Backplane. Three serial I/O ports, video cassette back-up I/O and SASI peripheral bus I/O for adding additional storage peripherals are provided.

Continued on page 147

AUGUST 1982

Columbia Data's New Multi-Personal Computer Is Now Ready For Business

With IBM Personal Computer Software And Hardware Compatibility . . . For Starters.

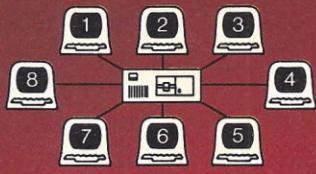


Multi-Personal Computer can use software and hardware originally intended for the IBM® Personal Computer . . . while enjoying the flexibility and expandability of all of Columbia Data's computer systems.

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First, neatly cut out the "370" label.

Now, when nobody's looking, nonchalantly tape it to your terminal, just under the "IBM" as if it really belonged there.

Then wait for your chance and quickly slip a dBASE II™ disk into your main drive.

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And you're ready with more data handling power than you would have dreamed possible before dBASE II.

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You'll find that dBASE II, because it's a relational database management system (DBMS), starts where file handling programs leave off.

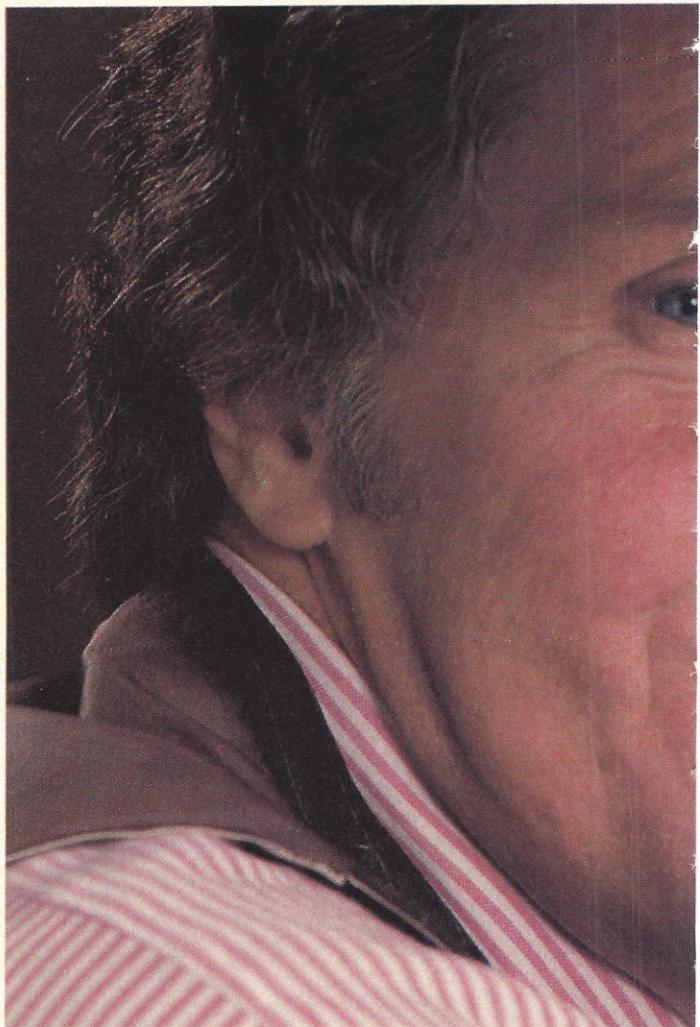
dBASE II handles multiple databases and simplifies everything from accounting to department staffing to monitoring rainfall on the Upper Volta.

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Easy to look at, easy to use.

Input screens and output forms couldn't be easier—just "paint" your format on the CRT and what you see is what you'll get.



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AUGUST 1982

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INTERFACE AGE 77

Business Systems Comparison

by Terry Benson

The latest in our series of business systems comparisons offers up-to-date specifications on many current offerings. Our rule-of-thumb criteria for this survey was systems that can be purchased for less than \$10,000. However, in many cases the price listed reflects only the price of the computer and mass storage—not necessarily including any peripherals or applications software. It is important to allow for these when evaluating the total system cost.

The accompanying charts attempt to consolidate the pertinent information that we normally report when comparing various business computers in the lower price range. While the facts are as accurate as could be confirmed at press time, it would be advisable to contact the companies for exact data on your configuration requirements.

The brief descriptions that follow describe the individual companies with some additional facts not covered in the charts.

When reading the charts, don't be misled by the price alone. A price difference of a few thousand dollars between systems may seem attractive at first glance, but consider each individual item in the charts—particularly, storage capacity and software included with the system. It's also important to note that a system integrating the terminal into the package will not require the additional cost of a separate terminal.

While it is obviously not possible to pro-

vide a complete list of the hundreds of business systems on the market—not even all systems in the under-\$10,000 range—there are many systems described here worth serious consideration. The careful buyer should study his needs thoroughly to find the individual package best suited to his budgetary and work requirements.

Alpha Micro

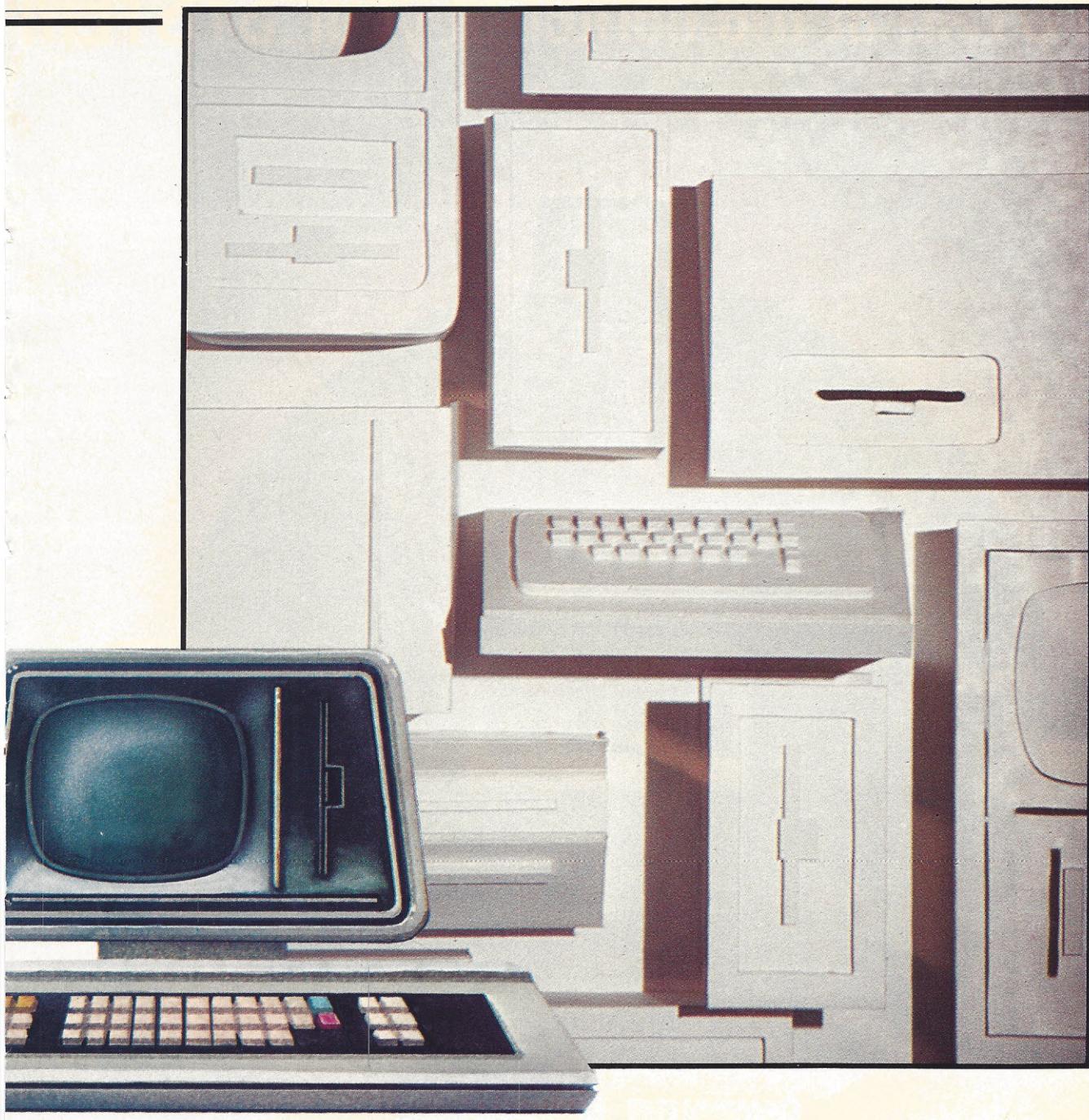
This latest family of high-end micros from one of the leaders in the field incorporates the 68000 processor. Programming languages, including Basic and Pascal, are offered with the systems. The company's own multi-user operating system (AMOS) is included in the basic price. Price of the systems are set by the dealer, who should provide a basic system for just under \$10,000.

Alspa Computer

The system is essentially packaged in the same compartment as the disk drive(s). The ACI-2 squeezes two drives into the space of the standard 8-in. space, thereby doubling the capacity. Single or double-sided drives are available. The small package should make this attractive for someone with little space to spare.

Altos

The three systems chosen for our comparison chart are but a sampling of the numerous models and configurations



available from this well-established company. One of the major advantages of the selections is the ability to expand and enhance a lower cost system as your business requirements grow. Each system can be upgraded to include high-capacity Winchester disks and other peripherals as required. CP/M is optional with any system. Multiuser MP/M or OASIS can be included. Even the new low-cost Series 5 allows up to three users to share a common database; it can be expanded with the new micro-Winchester hard disk technology. The 8000-15 (I/A May 82) and the 8000-10

(I/A Jul 82) both support up to four users with up to three printers.

American Computer

This company integrates the terminal and printer with each system. In fact, this is one of the few systems that comes completely equipped for the small business user—not only with hardware but also with word processing and a database management software. All software has been developed in a high-level database language that is proprietary to the company. In addition to the floppy-based

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Prices: \$1900.00 for 6.4 megs \$2200.00 for 12.8 megs Dealer inquiries invited.

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system that includes one terminal and one letter quality printer, the systems can also be ordered with a hard disk of either 5 or 10M bytes. Multi-user capability allows the system to expand along

Don't be misled by price alone... consider each individual item...

with your needs. The company also offers eight hours of software customization prior to installation in order to configure the system for the user's unique requirements.

Apple

A veteran in the microcomputer arena, Apple has not only enhanced its position in the marketplace but also the position of a number of other companies supporting both hardware and software for use with Apple systems. The Apple II (IA Oct 81) probably provides one of the better examples of a low-cost business computer. With the extensive support from so many suppliers, the system offers a comprehensive range of business applications.

The recently re-introduced Apple III (IA May 82) includes a single 5½-in. disk drive integrated into the unit. An additional drive can be added externally, and the user can add his own monitor. The cost listed in the comparison charts includes a monitor and the Business Basic language.

Applied Digital Data Systems

One of the world's largest suppliers of CRT display terminals, this company has begun to play a major role in computer systems as well, particularly with the latest introduction of the Multivision model 8-5. The basic unit supports one user, but can be easily expanded with a multiuser box to handle up to four simultaneous users. This allows a business to start out with a small computer and add on as the computing requirements grow.

The company (perhaps better known as ADDS) optionally offers its own MUON operating system (IA Sep 81), which is claimed to be a superset of CP/M. A significant advantage of MUON is that it was designed in conjunction with the Multivision hardware, thereby maximizing system features, so that application programs can run faster than standard off-the-shelf packages. The fact that it is CP/M-compatible also allows a large number of programs to operate on a Multivision system.

Archives Inc.

From the heartland of the U.S.—Davenport, IA—this company produces a family of mid-range computer systems. All are based on the popular S-100 bus and are provided with the *de facto* standard CP/M operating system. The terminal is integrated into the system, eliminating the necessity of having to purchase an additional peripheral. This provides a convenient table-top module with minimum space requirements.

Basic Four

The newest product from this veteran business computer house provides a low-cost entry into the business computer market. Dual Z80s and a generous amount of RAM support the standard CP/M operating system and the ever-popular Business Basic. If you are looking for more than a single-user system, Basic Four provides several other models for all sizes of business.

BMC Computer

This company uniquely integrates a CRT, diskettes and a printer into a common package. The display is a 12-in. color CRT with programmable display options of from 80-by-25 to a format of 40-by-20 with smooth scrolling providing a very pleasing display. The user is presented with an enhanced keyboard including 10 programmable function keys. The pair of floppies are dual-sided double density.

The dot matrix printer uses conventional paper and prints at 80 characters-per-second. A graphics mode is also included. The standalone terminal is designed to operate as a workstation in a network of up to 256 terminals. The 20C offers the same capacity as the 20B but additionally includes five business software packages.

California Computer Systems

For the past few years, this company has been offering a family of computer systems differentiated primarily by the initial size of memory and the particular type of mass storage with the system. CP/M is included with each system but MP/M and OASIS can optionally be added to support up to 16 users that can be configured in the system. With a 19-slot backplane, each system can be expanded with the S-100 bus architecture to handle the requirements of even the most ambitious small business. (See review article elsewhere in this issue.)

Codata Systems

This is one of the few companies that incorporates the otherwise popular Multibus originally developed by Intel. The processor used is the more popular Z80A. The CTS-100/6 first looks more expensive than

**Charts follow
Text continues on page 92**

Table 1. Hardware Data

Manufacturer	System	Price	Enclosure			CPU		Bus	Peripherals	
			Tabletop	Desk-Built-In	Rack-Mounted	Type	Bits		Terminal Std/Max	Printer Std/Max
Alpha Microsystems	AM-1000-04	n/a	std	none	none	68000	16/32	none	none/3	none/2
	AM-1000-07	n/a	std	none	none	68000	16/32	none	none/3	none/2
	AM-1000-08	n/a	std	none	none	68000	16/32	none	none/3	none/2
Alspa Computers	ACI-1	\$2,170	std	none	none	Z80A	8	none	none/1	none/2
	ACI-2	\$3,170	std	none	none	Z80A	8	none	none/1	none/2
	ACI-0	\$1,370	std	none	none	Z80A	8	none	none/1	none/2
Altos Computer Systems	8000-15 series	\$4,990	none	none	std	Z80	8	none	none/4	none/3
	5-15 series	\$2,990	std	none	none	Z80	8	none	none/3	none/2
	8000-10 series	\$8,500	none	none	std	Z80	8	none	none/4	none/3
American Computer Corp.	System 102W	\$9,995	std	opt	opt	Z80	8	prop	1/4	1/2
Apple Computer	Apple II	\$2,175	std	none	none	6502	8	prop	1/1	none/1
	Apple III	\$3,940	std	none	none	6502B	8	prop	1/1	none/1
Applied Digital Data Systems	Multivision 1	\$3,785	std	none	none	8085-2	8	prop	none/1	none/3
	Multivision 8-5	\$5,995	std	none	none	8085-2	8	prop	none/4	none/3
Archives	Model I	\$5,500	std	none	none	Z80	8	S-100	1/1	none/1
	Model II	\$6,200	std	none	none	Z80	8	S-100	1/1	none/1
	Model III	\$8,500	std	none	none	Z80	8	S-100	1/1	none/1
Basic Four	S/10	\$5,995	std	none	none	Z80	8	none	1/1	none/1
BMC Computers	IF800 20B	\$6,995	std	none	none	Z80A	8	prop	1/1	1/1
	IF800 20C	\$7,995	std	none	none	Z80A	8	prop	1/1	1/1
California Computer Systems	302	\$5,295	std	none	opt	Z80	8	S-100	none/16	none/8
	411	\$8,750	std	none	opt	Z80	8	S-100	none/16	none/8
	421	\$9,400	std	none	opt	Z80	8	S-100	none/16	none/8
Codata System Corp.	CTS-100/6	\$9,937	std	none	none	Z80A	8	Multibus	1/1	none/1
Columbia Data Products	1500-3	\$3,995	std	none	none	Z80A	8	none	none/1	none/2
	1511-35	\$7,245	std	none	none	Z80A	8	none	none/5	none/2
	1800-2	\$5,995	std	none	none	Z80A	8	none	none/1	none/2
Compaq	EzTYPE	\$6,995	std	none	none	Z80	8	S-100	1/n/a	1/n/a
CompuPro	System 816/A	\$4,995	std	none	none	8085/8088	8/16	IEEE 696/S-100	none/1	none/2
	System 816/B	\$6,995	std	none	none	8085/8088	8/16	IEEE 696/S-100	none/6	none/2
	System 816/C	\$8,995	std	none	none	8085/8088	8/16	IEEE 696/S-100	none/16	none/2
Corvus Systems	Corvus Concept	\$4,995	std	none	none	MC68000	16/32	prop	1/1	none/2
Cromemco	System One	\$3,995	std	none	none	Z80A	8	S-100	none/3	none/2
	System Three	\$7,995	none	std	std	Z80A	8	S-100	none/6	none/2
Data Terminals & Communications	210 A	\$3,295	std	opt	none	8085-2	8	none	none/4	none/4
	210 A+B	\$6,995	std	opt	none	8085-2	8	none	none/4	none/4
Datavue Corp.	80-100	\$1,995	std	none	none	Z80A	8	none	none/1	none/1
	80-200	\$2,895	std	none	none	Z80A	8	none	none/1	none/1
	80-300	\$6,195	std	none	none	Z80A	8	none	none/1	none/1
Digilog Business Systems	S-1500	\$8,795	std	none	none	Z80A	8	none	1/1	none/2
Durango Systems	800 series	\$8,250	std	none	none	8085	8	none	1/5	1/5
Dynabyte	5505-A1	\$6,995	std	none	none	Z80	8	S-100	none/8	none/16
	5605-B2	\$7,995	std	none	none	Z80	8	S-100	none/8	none/16
	5710-A1	\$8,995	std	none	none	Z80	8	S-100	none/8	none/16
Eagle Computers	Eagle II	\$4,995	std	none	none	Z80A	8	none	none/1	none/2
	Eagle IV	\$8,995	std	none	none	Z80A	8	none	none/1	none/2
Fortune Systems	System One	\$4,995	std	none	none	MC68000	16/32	prop	1/16	none/16
	System Five	\$8,745	std	none	none	MC68000	16/32	prop	1/16	none/16
	System Ten	\$9,745	std	none	none	MC68000	16/32	prop	1/16	none/16

Gimix	49	\$3,248	std	none	none	6809	8	S50	none/4	none/16
	39	\$3,798	std	none	none	6809	8	S50	none/4	none/16
	09	\$8,998	std	none	none	6809	8	S50	none/4	none/16
Gnat Computers	System 10	\$4,450	std	none	none	Z80A	8	none	1/1	none/3
Hewlett-Packard	HP-85A	\$2,750	std	none	none	NMOS	8	prop	1/1	1/1
	HP-87A	\$3,995	std	none	none	NMOS	8	prop	1/1	1/1
	HP-125-10	\$7,460	std	none	none	Z80A	8	prop	1/1	1/2
IBC	Cadet	\$5,595	std	none	opt	Z80B	8	none	none/9	none/9
IBM	Personal Computer	\$3,045	std	none	none	8088	8/16	prop	1/1	none/1
	5000 SX	\$3,495	std	none	none	Z80	8	S-100	none/14	none/14
IMS International	8000 SX	\$4,495	std	none	none	Z80	8	S-100	none/14	none/14
	8000 S	\$5,595	none	std	none	Z80	8	S-100	none/14	none/14
Intelligent Systems	8364	\$8,130	std	none	none	8080A	8	prop	1/1	none/1
	3651	\$2,945	std	none	none	8080A	8	none	1/1	none/1
Intertec Data Systems	SuperBrain	\$2,495	std	none	none	Z80A	8	prop	1/1	none/2
	CompuStar	\$1,995	std	none	none	Z80A	8	prop	1/1	none/2
Logical Business Machines	David	\$7,800	std	none	none	8086	16	prop	1/2	1/1
Micro Five	Microstar I	\$7,085	std	none	std	8085	8	none	1/3	none/2
	Advantage	\$4,198	std	none	none	Z80A	8	n/a	1/1	none/1
North Star Computers	Advantage	\$6,898	std	none	none	Z80A	8	n/a	1/1	none/1
	Horizon	\$7,749	none	std	none	Z80A	8	S-100	none/5	none/2
Onyx Systems	Sundance/132	\$8,995	std	none	none	Z80	8	none	1/1	none/2
Osborne	Osborne I	\$1,795	std	none	none	Z80A	8	none	1/1	none/1
Polymorphic Systems	8810	\$3,595	std	none	none	8080	8	S-100	none/1	none/2
	8813	\$5,595	std	opt	opt	8080	8	S-100	none/2	none/2
Radio Shack	TRS-80 Model III	\$2,495	std	none	none	Z80A	8	prop	1/1	none/1
	TRS-80 Model II	\$3,499	std	opt	none	Z80A	8	prop	1/1	none/2
	TRS-80 Model 16	\$5,798	std	opt	none	Z80A, MC68000	16/32	prop	1/2	none/2
Sanyo	MBC 1000	\$1,995	std	none	none	Z80	8	prop	none/1	none/1
	MBC 2000	\$3,495	std	none	none	8085	8	prop	1/1	none/1
	MBC 3000	\$6,495	std	none	none	8085	8	Multibus	1/2	none/1
SD Systems	WS 800	\$2,495	std	none	none	Z80A	8	none	1/1	none/2
	SD 200	\$9,700	std	none	none	Z80A	8	S-100	1/5	none/2
	MS 200	\$6,495	std	none	none	Z80A	8	S-100	none/5	none/2
Seattle Computer	System 2	\$4,185	std	none	none	8086	16	S-100	none/1	none/1
Smoke Signal Broadcasting	Chieftain 9822	\$6,970	std	opt	opt	6809	8/16	SS-50	1/16	1/16
Systems Group	System 2824	\$6,545	std	none	opt	Z80A	8	S-100	none/12	none/4
	System 2829	\$9,565	std	none	opt	Z80A	8	S-100	none/12	none/4
TEI	System 48/DL	\$7,995	std	none	opt	Z80B	8	prop	none/8	none/2
TeleVideo Systems	System TS802	\$3,495	std	none	none	Z80A	8	none	1/1	none/2
Texas Instruments	Business System 220	\$6,200	std	none	none	TMS 9900	16	prop	1/1	none/1
TRW-Fujitsu Co.	Affinity 16	\$7,750	std	none	none	46A	16	prop	1/3	n/a
Tricomp Systems	System 1	\$6,995	std	none	none	Z8001	16	none	none/4	none/1
Vector Graphic	System 2600	\$5,195	std	none	none	Z80B	8	S-100	1/1	none/2
	System 3005	\$7,950	std	none	none	Z80B	8	S-100	1/1	none/2
Wang	Wang Writer	\$6,400	std	none	none	Z80	8	none	1/1	1/1
	Model 235	\$7,595	std	none	std	8085	8	Multibus	none/1	none/1
Zandex	Model 238	\$7,995	std	none	std	8088	16	Multibus	none/1	none/2
	Model 925	\$8,610	std	none	none	8085	8	Multibus	none/5	none/2
Zenith Data Systems	Z89	\$2,895	std	none	none	Z80	8	none	1/2	none/2
	Z90	\$3,195	std	none	none	Z80	8	none	1/2	none/2

n/a = information not available none = not available from manufacturer; might be available through outside sources

std = standard opt = optional prop = proprietary

Table 2. Memory/Mass Storage Data

Manufacturer	System	Memory (RAM) K-byte		Mass Storage Description & Capacity					
		Std	Max	Floppy Disk K-byte		Winchester Disk M-byte		Tape M-byte	
		Std	Max	Std	Max	Std	Max	Std	Max
Alpha Microsystems	AM-1000-04	128	512	1300	1300	none	none	none	80
	AM-1000-07	128	512	none	700	10	10	80	80
	AM-1000-08	128	512	700	700	10	70	none	80
Alspa Computers	ACI-1	64	64	600	1200	none	20	none	100
	ACI-2	64	64	1200	2400	none	20	none	100
	ACI-0	64	64	none	none	none	20	none	100
Altos Computer Systems	8000-15 series	208	208	1000	2000	none	40	none	17.2
	5-15 series	192	192	2000	2000	none	11	none	none
	8000-10 series	208	208	500	500	10	40	none	17.2
American Computer Corp.	System 102W	128	128	630	1200	none	40	none	none
Apple Computer	Apple II	48	64	170	340	none	none	none	audio
	Apple III	128	256	140	280	none	5	none	none
Applied Digital Data Systems	Multivision 1	64	256	716	716	none	10	none	none
	Multivision 8-5	64	256	800	800	5	5	none	none
Archives	Model I	64	64	386	772	none	none	none	none
	Model II	64	64	780	780	none	none	none	none
	Model III	64	64	780	780	5	5	none	none
Basic Four	S/10	128	128	1310	1310	none	none	none	none
BMC Computers	IF800 20B	64	320	800	800	none	10	none	opt
	IF800 20C	128	320	800	800	none	10	none	opt
California Computer Systems	302	64	512	2400	4800	none	none	none	none
	411	64	512	1200	4800	20	80	none	none
	421	64	512	2400	4800	none	none	none	none
Codata System Corp.	CTS-100/6	64	1500	350	350	5.5	5.5	none	none
Columbia Data Products	1500-3	64	256	1600	1600	none	none	none	none
	1511-35	256	256	800	800	5	10	none	none
	1800-2	64	256	2400	2400	none	none	none	none
Compaq	EzTYPE	56	n/a	630	1200	none	90	none	none
CompuPro	System 816/A	128	16000	2400	4800	none	200	none	none
	System 816/B	192	16000	2400	4800	none	200	none	none
	System 816/C	320	16000	2400	4800	none	200	none	none
Corvus Systems	Corvus Concept	256	512	none	1000	none	20	none	73
Cromemco	System One	64	512	780	3260	none	77	none	none
	System Three	64	512	2400	4800	none	77	none	none
Data Terminals & Communications	210 A	64	64	600	600	none	36	none	18
	210 A+B	64	64	600	600	18	36	none	18
Datavue Corp.	80-100	64	64	250	500	none	none	none	none
	80-200	64	64	500	2000	none	none	none	none
	80-300	64	64	500	1000	6	30	none	20
Digilog Business Systems	S-1500	64	64	820	820	5	10	none	none
Durango Systems	800 series	64	192	1892	3784	none	14.34	none	none
	5505-A1	64	400	315	315	5.3	42	none	13.4
	5605-B2	64	400	600	600	10.6	42	none	none
Dynabyte	5710-A1	64	400	none	none	8.9	42	13.4	13.4
	Eagle II	64	64	780	1600	none	none	none	none
	Eagle IV	64	64	780	780	7.5	15	none	none
Eagle Computers	System One	128	1000	800	3200	none	80	none	17
	System Five	128	1000	800	3200	5	80	none	17
	System Ten	128	1000	800	3200	10	80	none	17

Gimix	49	56	832	none	4000	none	76	none	none
	39	128	832	none	4000	none	76	none	none
	09	120	632	1000	4000	19	76	none	none
Gnat Computers	System 10	64	64	700	1600	none	10	none	none
Hewlett-Packard	HP-85A	16	32	none	1080	none	5	210	210
	HP-87A	32	540	270	1080	none	5	none	none
	HP-125-10	64	64	512	2400	none	5	none	none
IBC	Cadet	64	256	2000	4000	none	50	none	46
IBM	Personal Computer	64	256	160	320	none	none	none	none
	5000 SX	64	512	408	2500	none	12	none	17
IMS International	8000 SX	64	512	512	4800	none	40	none	17
	8000 S	64	512	512	7200	none	40	none	17
Intelligent Systems	8364	64	64	1900	1900	none	none	none	none
	3651	32	64	90	1900	none	none	none	none
Intertec Data Systems	SuperBrain	64	64	350	3000	none	10	none	none
	CompuStar	64	64	350	3000	none	10	none	none
Logical Business Machines	David	64	64	1000	1000	none	20	none	none
Micro Five	Microstar I	64	64	2400	2400	none	20	none	none
	Advantage	64	64	720	720	none	none	none	none
North Star Computers	Advantage	64	64	360	360	5	5	none	none
	Horizon	160	352	360	360	5	72	none	13.4
Onyx Systems	Sundance/132	64	64	none	none	6.7	6.7	12	12
Osborne	Osborne I	64	64	204	408	none	none	none	none
Polymorphic Systems	8810	56	64	360	1080	none	none	none	none
	8813	64	104	1080	4000	none	16	none	none
Radio Shack	TRS-80 Model III	48	48	368	736	none	none	none	none
	TRS-80 Model II	64	64	416	1870	none	33	none	none
	TRS-80 Model 16	128	512	2500	5000	none	33	none	none
Sanyo	MBC 1000	64	64	320	2300	none	none	none	none
	MBC 2000	64	64	640	1280	none	none	none	none
	MBC 3000	64	64	2000	4000	none	none	none	none
SD Systems	WS 800	64	64	none	2000	none	none	none	none
	SD 200	64	256	2000	2000	none	10	none	14
	MS 200	64	256	2000	2000	none	10	none	14
Seattle Computer	System 2	128	1000	none	4800	none	none	none	none
Smoke Signal Broadcasting	Chieftain 9822	64	1000	2000	4000	none	120	none	80
Systems Group	System 2824	128	512	2520	5000	none	20	none	20
	System 2829	128	512	1260	5000	10	10	none	20
TEI	System 48/DL	128	576	none	1100	5	36	none	opt
TeleVideo Systems	System TS802	64	64	1000	1000	none	none	none	none
Texas Instruments	Business System 220	64	64	1200	1200	none	none	none	none
TRW-Fujitsu Co.	Affinity 16	124	124	640	640	none	10	none	none
Tricomp Systems	System 1	256	512	1400	1400	none	30	none	none
Vector Graphic	System 2600	64	128	1200	1800	none	5	none	none
	System 3005	64	128	630	630	5	5	none	none
Wang	Wang Writer	96	128	300	600	none	none	none	none
	Model 235	64	64	1000	2000	none	10	none	none
Zandex	Model 238	64	64	1000	2000	none	10	none	none
	Model 925	64	64	1500	2000	none	10	none	none
Zenith Data Systems	Z89	48	64	100	2100	none	10	none	none
	Z90	64	64	160	3500	none	10	none	none

Table 3. Systems Software Data

Manufacturer	System	Operating System		Programming Languages						
		Single-User	Multi-User	Assembler	Basic	Cobol	Fortran	Pascal	Other	
Alpha Microsystems	AM-1000-04	none	AMOS	std	std	none	none	std	LISP	
	AM-1000-07	none	AMOS	std	std	none	none	std	LISP	
	AM-1000-08	none	AMOS	std	std	none	none	std	LISP	
Alspa Computers	ACI-1	CP/M	Corvus, Constellation	opt	opt	opt	opt	opt	none	
	ACI-2	CP/M	Corvus, Constellation	opt	opt	opt	opt	opt	none	
	ACI-0	CP/M	Corvus, Constellation	opt	opt	opt	opt	opt	none	
Altos Computer Systems	8000-15 series	CP/M	MP/M, OASIS	opt	opt	opt	opt	opt	APL, PL/I	
	5-15 series	CP/M	MP/M, OASIS	opt	opt	opt	opt	opt	APL, PL/I	
	8000-10 series	CP/M	MP/M, OASIS	opt	opt	opt	opt	opt	APL, PL/I	
American Computer Corp.	System 102W	none	std	none	none	none	none	none	SQ	
Apple Computer	Apple II	DOS	none	opt	std	none	opt	opt	PILOT	
	Apple III	SOS	none	none	std	none	opt	opt	none	
Applied Digital Data Systems	Multivision 1	opt	opt	opt	opt	opt	opt	opt	none	
	Multivision 8-5	opt	opt	opt	opt	opt	opt	opt	none	
Archives	Model I	CP/M	none	opt	opt	opt	opt	opt	opt	
	Model II	CP/M	none	opt	opt	opt	opt	opt	opt	
	Model III	CP/M	none	opt	opt	opt	opt	opt	opt	
Basic Four	S/10	CP/M	BB/M	none	std	none	none	none	none	
BMC Computers	IF800 20B	CP/M	none	opt	std	opt	opt	opt	Algol, AVL, PL/I	
	IF800 20C	CP/M	none	opt	std	opt	opt	opt	Algol, AVL, PL/I	
California Computer Systems	302	CP/M	MP/M, OASIS	std	opt	opt	opt	opt	none	
	411	CP/M	MP/M, OASIS	std	opt	opt	opt	opt	none	
	421	CP/M	MP/M, OASIS	std	opt	opt	opt	opt	none	
Codata System Corp.	CTS-100/6	CP/M	none	opt	opt	opt	opt	opt	C	
Columbia Data Products	1500-3	CP/M	none	std	opt	opt	opt	opt	opt	
	1511-35	CP/M	MP/M	std	opt	opt	opt	opt	opt	
	1800-2	CP/M	none	std	opt	opt	opt	opt	opt	
Compaq	EzTYPE	CP/M	MP/M, UNIX	opt	opt	opt	opt	opt	opt	
CompuPro	System 816/A	CP/M86	opt	std	opt	opt	opt	opt	opt	
	System 816/B	CP/M86	opt	std	opt	opt	opt	opt	opt	
	System 816/C	none	MP/M86	std	opt	opt	opt	opt	opt	
Corvus Systems	Corvus Concept	Concept	Concept	none	opt	opt	std	std	none	
Cromemco	System One	opt	opt	opt	opt	opt	opt	none	LISP, RATFOR	
	System Three	opt	opt	opt	opt	opt	opt	none	LISP, RATFOR	
Data Terminals & Communications	210 A	S210	M210	opt	std	opt	opt	opt	HUBBS, C, CP/M	
	210 A+B	S210	M210	opt	std	opt	opt	opt	HUBBS, C, CP/M	
Datavue Corp.	80-100	CP/M	none	opt	opt	opt	opt	opt	none	
	80-200	CP/M	none	opt	opt	opt	opt	opt	none	
	80-300	CP/M	opt	opt	opt	opt	opt	opt	none	
Digilog Business Systems	S-1500	CP/M Turbo-Dos	none	opt	std	opt	opt	opt	none	
Durango Systems	800 series	CP/M	DX-85M	none	opt	opt	none	none	none	
Dynabyte	5505-A1	CP/M, OASIS	MP/M, OASIS	opt	opt	opt	opt	opt	none	
	5605-B2	CP/M, OASIS	MP/M, OASIS	opt	opt	opt	opt	opt	none	
	5710-A1	CP/M, OASIS	MP/M, OASIS	opt	opt	opt	opt	opt	none	
Eagle Computers	Eagle II	CP/M	none	opt	opt	opt	opt	opt	opt	
	Eagle IV	CP/M	none	opt	opt	opt	opt	opt	opt	
Fortune Systems	System One	UNIX	UNIX	none	opt	opt	opt	opt	C	
	System Five	UNIX	UNIX	none	opt	opt	opt	opt	C	
	System Ten	UNIX	UNIX	none	opt	opt	opt	opt	C	

Gimix	49	std	std	opt	opt	opt	none	opt	C
	39	std	std	opt	opt	opt	opt	opt	C
	09	std	std	opt	opt	opt	none	opt	C
Gnat Computers	System 10	CP/M	none	std	opt	opt	opt	opt	PL/I, C
Hewlett-Packard	HP-85A	HP80	none	opt	std	none	none	none	Forth
	HP-87A	HP80, CP/M	none	opt	std	opt	none	opt	Forth
	HP-125-10	CP/M	none	none	opt	none	none	none	none
IBC	Cadet	CP/M	OASIS	opt	opt	opt	opt	opt	none
IBM	Personal Computer	DOS	none	none	std	opt	opt	opt	Communications
	5000 SX	CP/M, Turbo DOS	MP/M, Turbo DOS	opt	opt	opt	opt	opt	C Basic
IMS International	8000 SX	CP/M, Turbo DOS	MP/M, Turbo DOS	opt	opt	opt	opt	opt	C Basic
	8000 S	CP/M, Turbo DOS	MP/M, Turbo DOS	opt	opt	opt	opt	opt	C Basic
Intelligent Systems	8364	CP/M	none	std	std	opt	opt	none	none
	3651	FCS	none	opt	std	none	opt	none	none
Intertec Data Systems	SuperBrain	CP/M	none	std	opt	none	opt	none	none
	CompuStar	CP/M	CP/M	std	opt	none	opt	none	none
Logical Business Machines	David	std	none	none	none	none	none	none	English
Micro Five	Microstar I	CP/M	STARDOS	none	std	none	none	none	none
North Star Computers	Advantage	ASP	none	none	opt	opt	opt	opt	none
	Advantage	CP/M	none	none	opt	opt	opt	opt	none
	Horizon	none	CP/M, NS, DOS	none	opt	opt	opt	opt	none
Onyx Systems	Sundance/132	OASIS, CP/M	none	opt	opt	opt	none	none	none
Osborne	Osborne I	CP/M	none	std	std	none	none	none	Forth
Polymorphic Systems	8810	Exec	none	std	std	none	none	none	CP/M
	8813	Exec	opt	std	std	none	none	none	CP/M
Radio Shack	TRS-80 Model III	TRSDOS	none	opt	std	opt	opt	opt	Micro Pilot Author I
	TRS-80 Model II	TRSDOS	none	opt	std	opt	opt	none	opt
	TRS-80 Model 16	TRSDOS	opt	std	std	opt	opt	none	opt
Sanyo	MBC 1000	CP/M	none	none	std	none	none	none	Forth
	MBC 2000	CP/M	none	none	std	none	none	none	Forth
	MBC 3000	CP/M	none	none	std	none	none	none	Forth
	WS 8000	CP/M	none	none	opt	opt	none	none	none
SD Systems	SD 200	CP/M, OASIS	MPM II, OASIS	none	opt	opt	none	none	none
	MS 200	CP/M, OASIS	MPM II, OASIS	none	opt	opt	none	none	none
Seattle Computer	System 2	MS-DOS	none	std	opt	opt	opt	opt	opt
Smoke Signal Broadcasting	Chieftain 9822	DOS690, Flex	05-9	std	opt	opt	none	opt	Forth, C
Systems Group	System 2824	CP/M	MP/M, OASIS	none	none	none	none	none	Business Express
	System 2829	CP/M	MP/M, OASIS	none	none	none	none	none	Business Express
TEI	System 48/DL	MAGIC	MAGIC	std	std	opt	opt	none	Forth, C
TeleVideo Systems	System TS802	opt	opt	opt	opt	opt	opt	opt	opt
Texas Instruments	Business System 220	DX-10	none	none	none	opt	none	none	UCSDp-system
TRW-Fujitsu Co.	Affinity 16	opt	opt	opt	opt	opt	none	none	none
Tricomp Systems	System 1	none	XENIX	std	opt	opt	opt	opt	C
Vector Graphic	System 2600	CP/M	none	std	std	opt	opt	opt	APL
	System 3005	CP/M	none	std	std	opt	opt	opt	APL
Wang	Wang Writer	std	none	none	opt	none	none	none	CP/M
	Model 235	CP/M	MP/M	std	opt	none	none	none	none
Zendex	Model 238	CP/M	MP/M	std	opt	none	none	none	none
	Model 925	CP/M	MP/M	std	opt	none	none	none	none
Zenith Data Systems	Z89	CP/M	none	std	std	opt	opt	opt	opt
	Z90	CP/M	none	std	std	opt	opt	opt	opt

Table 4. Applications Software Data

Table 5. Corporate Data

Manufacturer's Name and Address	When Established	Dealers		Service Centers		System's 1st Delivery	Total Delivered
		U.S.	Foreign	U.S.	Foreign		
Alpha Microsystems 17881 Sky Park North, Irvine, CA 92713	1977	187	27	32	27	1982	n/a
Alspa Computers, Inc. 300 Harvey West Blvd., Santa Cruz, CA 95060	1981	100	20	8	3	1981	n/a
Altos Computer Systems 2360 Bering Dr., San Jose, CA 95131	1977	500	n/a	n/a	n/a	1977	22,000
American Computer Corp. 4915 Mercury, San Diego, CA 92111	1977	12	1	14	2	1977	500+
Apple Computer, Inc. 10200 Bandley Dr., Cupertino, CA 95014	1976	1,000+	1,000+	1,000+	1,000+	1977 1980	250,000+
Applied Digital Data Systems, Inc. 100 Marcus Blvd., Hauppauge, NY 11787	1969	50	50	1,000	100	1980	2,500
Archives, Inc. 404 W. 35th St., Davenport, IA 52806	1978	150	10	n/a	n/a	1978	1,500
Basic Four Information Systems Division 14101 Myford Rd., Tustin, CA 92680	1971	75	30+	75	30+	1982	n/a
BMC Computer Corp. 860 E. Walnut St., Carson, CA 90746	1979	n/a	n/a	n/a	n/a	1980	8,000
California Computer Systems, Inc. 250 Caribbean Dr., Sunnyvale, CA 94086	1979	n/a	n/a	n/a	n/a	1980	n/a
Codata Systems Corp. 285 N. Wolfe Rd., Sunnyvale, CA 94086	1979	2	3	2	2	1980	2,000
Columbia Data Products 8990 Route 108, Columbia, MD 21045	1975	22	15	n/a	n/a	1981	200
Compal, Inc. 6300 Variel, Woodland Hills, CA 91367	1976	n/a	n/a	5	1	1976	1,000
CompuPro Systems Oakland Airport, CA 94614	1974	125	25	60	15	1982	n/a
Corvus Systems, Inc. 2029 O'Toole, San Jose, CA 95131	1979	100	20	70	20	1982	n/a
Cromemco, Inc. 280 Bernardo Ave., Mt. View, CA 94043	1975	300	50	30	50	n/a	n/a
Data Terminals & Communications 590 Division St., Campbell, CA 95008	1968	n/a	n/a	n/a	n/a	1975	2,400
Datavue Corp. 1911-22nd Ave. South, Seattle, WA 98144	1971	20	3	20	3	1981	200
Digilog Business Systems P.O. Box 355, Montgomeryville, PA 18936	1969	30	5	n/a	n/a	1981	n/a
Durango Systems, Inc. 3003 N. First Street, San Jose, CA 95134	1977	145	50	46	30	1978	4,000
Dynabyte Business Computers 521 Cottonwood Dr., Milpitas, CA 95035	1977	170	140	147	37	1978	7,000
Eagle Computers 983 University Ave., Los Gatos, CA 95030	1971	200	10	10	3	1981	1,500
Fortune Systems 1501 Industrial Rd., San Carlos, CA 94070	n/a	n/a	n/a	n/a	n/a	1982	200
Gimix, Inc. 1337 West 37th Place, Chicago, IL 60609	1975	75	50	75	50	1980	1,000+
Gnat Computers, Inc. 701 A Whitney St., San Leandro, CA 94577	1976	n/a	n/a	n/a	n/a	1979	300
Hewlett Packard 3000 Hanover St., Palo Alto, CA 94304	1939	1,000	n/a	500	n/a	1980	n/a

Table 5. Corporate Data (continued)

Manufacturer's Name and Address	When Established	Dealers		Service Centers		System's 1st Delivery	Total Delivered
		U.S.	Foreign	U.S.	Foreign		
Integrated Business Computers 21592 Marilla St., Chatsworth, CA 91311	1979	60	20	1	n/a	1981	n/a
IBM P.O. Box 1328, Boca Raton, FL 33432	1924	n/a	n/a	n/a	n/a	1981	n/a
IMS International 2800 Lockheed Way, Carson City, NV 89701	1975	n/a	n/a	n/a	n/a	1978	6,500
Intelligent Systems Corp. 225 Technology Park, Norcross, GA 30092	n/a	n/a	n/a	n/a	n/a	1980	n/a
Intertec Data Systems Corp. 2300 Broad River Rd., Columbia, SC 29210	1973	150	50	150	50	1979 1981	n/a
Logical Business Machines 1294 Hammerwood Ave., Sunnyvale, CA 94086	1974	20	25	20	25	1980	n/a
Micro Five Corp. 17791 Sky Park Circle, Irvine, CA 92714	1977	45	15	3	n/a	1978	2,000+
North Star, Inc. 14440 Catalina St., San Leandro, CA 94577	1976	700+	n/a	20	n/a	1981 1982	30,000+
Onyx Systems, Inc. 25 E. Trimble Rd., San Jose, CA 95131	1977	n/a	n/a	n/a	n/a	1981	150
Osborne Computer Corp. 26500 Corporate Ave., Hayward, CA 94545	1981	300	150	300	150	1981	15,000
Polymorphic Systems 5730 Thornwood Dr., Santa Barbara, CA 93111	1975	n/a	n/a	5	3	1977 1978	7,500
Radio Shack One Tandy Center, Fort Worth, TX 76102	1921	6,000+	2,000+	900+	n/a	1979 1982	n/a
Sanyo Business Systems Corp. 51 Joseph St., Moonachie, NJ 07074	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SD Systems, Inc. 10111 Miller Rd., Dallas, TX 75228	1977	100	10	1	1	1979	n/a
Seattle Computer 1114 Industry Dr., Seattle, WA 98188	1977	200	50	1	n/a	1981	200
Smoke Signal Broadcasting 31336 Via Colinas, Westlake, CA 91362	1977	130	25	130	25	1980	900
Systems Group 1601 Orangewood Ave., Orange, CA 92668	1978	450+	30+	n/a	n/a	1981	n/a
TEI, Inc. 5075 S. Loop East, Houston, TX 77033	1967	15	10	15	10	1981	n/a
TeleVideo Systems, Inc. 1170 Morse Ave., Sunnyvale, CA 94086	1976	n/a	n/a	n/a	n/a	1981	n/a
Texas Instruments, Inc. 12501 N. Central Expressway, Dallas, TX 75222	1931	n/a	n/a	n/a	n/a	1982	n/a
The TRW-Fujitsu Company 9841 Airport Blvd., Los Angeles, CA 90045	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TriComp Systems, Inc. 9698 Telestar Ave., Ste. 312, El Monte, CA 91731	1981	n/a	n/a	n/a	n/a	1982	n/a
Vector Graphic, Inc. 500 N. Ventu Park Rd., Thousand Oaks, CA 91320	1976	n/a	n/a	32	n/a	1978	16,000
Wang Laboratories, Inc. One Industrial Ave., Lowell, MA 01851	1951	n/a	n/a	n/a	n/a	n/a	n/a
Zendex Corp. 6644 Sierra Ln., Dublin, CA 94566	1979	12	4	1	4	1980	n/a
Zenith Data Systems 1000 Milwaukee Ave., Glenview, IL 60025	1979	550	100	375	75	1979 1980	n/a

many of the other systems, but the integration of both a floppy disk and a 5.5M-byte Winchester makes it a very economical system. CP/M is included in the price, whereas many other suppliers offer it as an extra cost option.

Columbia Data Products

The three systems listed are but a small sampling of the variety of configurations available from this company. Both single and multiuser systems are available in either 5 1/4-in. or 8-in. floppy configurations—many of which can be upgraded or expanded as required. The microcomputers support a variety

The careful buyer should study his needs thoroughly to find his best-suited configuration . . .

of special purpose business applications and can be used where up to five users require simultaneous execution.

The company also offers a family of other products, including a multiuser, multitasking, distributed computing system that shares the resources of a single computer with up to 16 user stations.

Compal Inc.

EzTYPE, as the name implies, is very easy to learn and use. The price includes a terminal and a 35 cps typewriter quality printer. Additional floppy disks can be added for up to 350 pages of on-line storage; for higher throughput a 55 cps printer can be incorporated.

The company also offers a full capability small business computer in its 8200 series, incorporating the word processing capabilities of EzTYPE plus a CP/M operating system that enables the use of thousands of business software packages. The 8200/M includes a dot matrix printer, a designer disk, Basic and Assembler programming languages and one software package of your choice (up to \$1,000). This seems to be the way to buy a system, since it not only includes all of the hardware and software, but also the training, reference manuals, starter supplies, delivery, installation and on-going support.

Comupro

These recently introduced systems offer superior performance by combining both the 8085 and the

8088 into a single unit. In the A and B versions, both operate at 6MHz, but the C uses a 7MHz 8085 and an 8MHz 8088 for even greater performance. A battery backed-up real time clock is included with the B and C systems, along with a sophisticated interrupt structure.

The MP/M-8/16 is like MP/M-86 but allows both 8- and 16-operation simultaneously by different users. This feature allows an even greater array of software to support a small business system.

Corvus Systems

Providing one of the most unique terminal arrangements, this unit allows a full page to be displayed. On a 15-in. diagonal screen, 72 lines of 85 columns display the software-generated character set. Not only does it allow a full screen, but the screen can be physically turned sideways to allow up to 120 columns to be displayed—particularly useful when working with a spreadsheet program.

The heart of the system is the 68000, which is configured on a 50-pin card socket. This engineering achievement just happens to allow any Apple II peripheral card to interface with this system. Four slots are available to expand the system when used with the Corvus Omnitel local area network, but the unit can operate on a stand-alone basis.

Cromemco

The company's 72-page microsystem catalog provides a hint that Cromemco means business when talking about microcomputers. In addition to the computer itself (IA Feb 81), the company offers a selection of S-100 based computer cards to expand the capability of even the least expensive unit. A generous selection of peripherals and disk configurations, along with a host of optional software, makes a convenient location to do one-stop shopping for a small business computer.

Data Terminals and Communications

This company's model 210 series is based on the 8085. The mid-range system is attractively priced, considering the 18M-bytes of hard disk storage available with the system. The company offers a custom version of both a single user operating system packaged with each model or an optional multiuser operating system. The hardware will support up to four simultaneous users and up to four printers.

Datavue

Although a relative newcomer to the business computer industry, this company has provided a unique collection of low-priced systems. The 80-100 portable computer is described as being "smaller than a lunch box." The model 80-300 can be

Continued on page 152

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Lewis Rosenfelder

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Hewlett-Packard's HP-87

by Dale N. Flanagan

Hewlett-Packard (Corvallis, OR) calls the recently-released HP-87 its Premier Personal Computer—and has given the system the flexibility and power to support such a label.

The system will accommodate an impressive 544K bytes of user memory. 32K bytes come standard with the machine. This gives the 87 a starting point memory that is the maximum for the HP-85. Plug-in memory modules are available in 32K, 64K and 128K-byte sizes. The HP-87 has four expansion slots—by plugging in four additional 128K-byte memory modules, maximum memory can be achieved—½ million bytes.

All this RAM is useable for program or data storage. The system has 48K bytes of ROM and an additional 16K bytes of screen memory to complement the user memory. This makes a stock HP-87 a 96K-byte machine (32K bytes of user RAM plus 48K bytes of ROM plus 16K bytes of screen memory). Correspondingly, a machine set up for maximum memory actually has 608K bytes.

The 48K-byte ROM contains the standard operating system, an Extended Basic, a disk operating system and an HP-IB interface that is a version of the IEEE, printer and graphics enhancements.

HP-87 Basic is a superset of HP-85 Basic. It is generally compatible with HP-85 Basic, and has been modified to allow use of all available user RAM. In contrast, the IBM Personal Computer's Basic, for instance, is currently limited to a 64K-byte program and data storage work area.

The HP-87 lacks the built-in tape drive and printer found on the HP-85. One internal printer command, the screen-dump COPY and several tape commands are eliminated from HP-87 Basic.

The 87 can usually load and run an 85 program that is stored on a disk. When an 85 program is loaded, the 87 recognizes this and will perform an automatic conversion process. First the user is notified with a PLEASE WAIT message. The 87 then starts to convert the 85 program to its own internal format. If the 87 comes across a line of code that it can't convert automatically, the line is turned into a comment line with the insertion of an exclamation point at the beginning of the line (the exclamation point is HP's alternative to the REM in Basic). When conversion is completed, the word DONE is displayed. The program can then be run or further

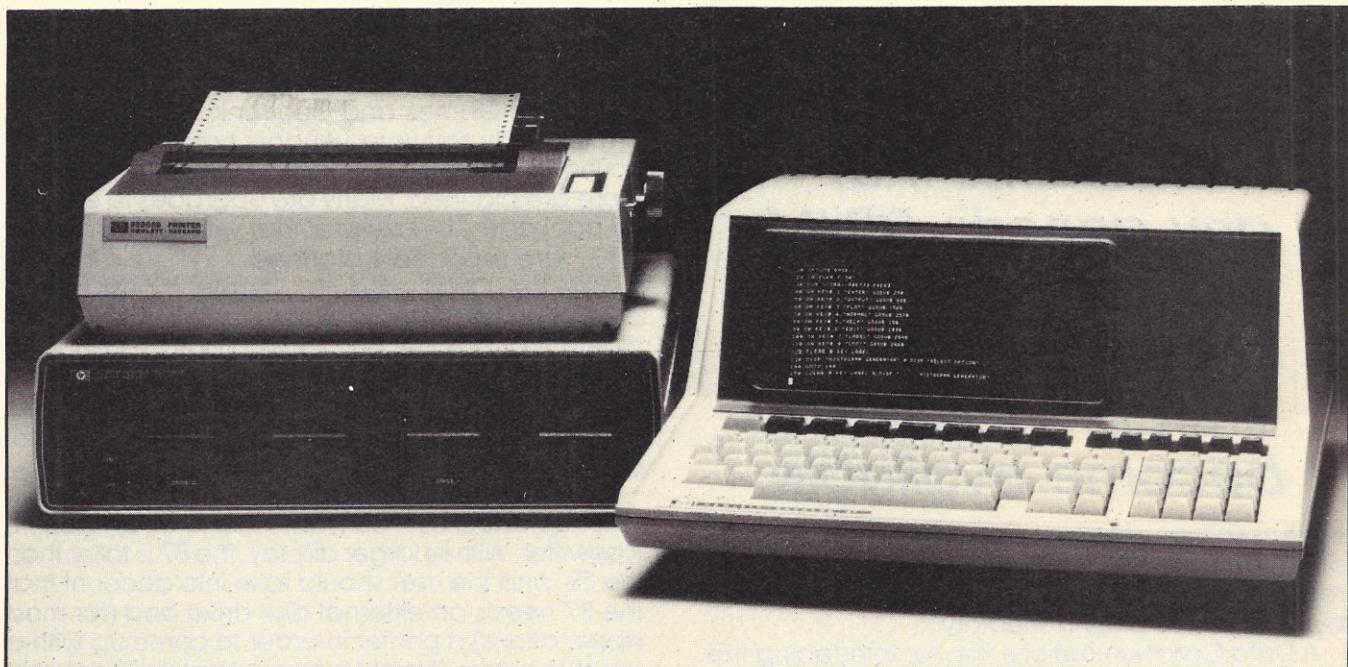
edited to take advantage of the 87's screen and graphics features. For a long 85 program, the automatic conversion process may take several minutes, but can be re-saved in the 87 format, so the conversion process does not have to be repeated.

In addition to the automatic conversion feature, 87 Basic provides several enhancements over 85 Basic, such as two-dimensional string arrays. (The 85 doesn't offer string arrays at all, unless you buy the advanced programmer's ROM.) Multi-character variable names, such as "ANGLE" or "FRED" are another asset. (With the 85, you're limited to single letter or letter/digit variables like "A" or "C7." Line labels provide further flexibility for the 87. You can specify something like "GOSUB test" in the program, instead of keeping track of the line numbers. Multi-parameter functions, such as A\$=FNA\$(X,Y,Z\$), are also possible. Multi-line functions are already supported in 85 Basic, and the expansion to multi-parameter functions can greatly reduce the amount of repetitive code found in a program.

Up to five binary programs can reside in the 87's memory at one time. (The 85 only allows one.) Chained programs on the 87 can execute immediately. On the 85, there's a delay each time a program is chained. All commands in HP's Mass Storage ROM are built-in. On the 85, this ROM is an extra cost (but necessary) option if you want to use a disk drive. Most of the printer and screen graphics enhancements found in the 85 Printer/Plotter ROM are built in. If the user wants to use an HP peripheral plotter, an extra cost Plotter ROM is necessary for the 87, however.

The 87 uses the same disk drives as the 85, with the same disk format. This gives the 87 user a choice of either a double-density, double-sided 5 1/4-in. floppy disk with 270K bytes of storage, or a 5-in. hard disk Winchester drive with 5M bytes. HP makes various combinations of these two drives, with single drives, double floppies, and Winchester/floppy combinations. HP drives come in their own cases, and although the 87 has the DOS and disk interface built-in, there is no provision for including a disk drive in the 87's case. Data and Visicalc files are interchangeable between the 85 and the 87.

The 87 has its own operating system, DOS and Basic; but will also accommodate CP/M with a plug-in module. This module is somewhat similar



to the Z80 cards available for Apple Computers, and has its own Z80 microprocessor. The HP module also has its own 64K bytes of RAM, and CP/M operation is restricted to this memory. In operation, the HP CP/M module actually acts like an independent computer, and the rest of the 87 is being used as a terminal to communicate with the CP/M module. CP/M 2.2 is supplied to the user along with the hardware module, as well as several manuals.

The four expansion slots may be filled with memory modules, a CP/M module or any of the series 80 interface modules.

The interface modules now include a 300-baud modem and an HP-IL interface, which allows the 87 to communicate with lower power devices, like the HP-41 hand-held calculator/computer. Interfaces are also available for RS-232C operation, Centronics type parallel, GPIO, BCD and HP-IB. An HP-IB is built-in to the 87 for disk drive and other peripheral connections.

The interface modules are the same for all series 80 computers, so they are the same modules used with the 85. Although the new modem and HP-IL interface can also be used with the 85, the 87's memory modules are not useable, and the HP-85's 16K-byte memory module won't work on the 87.

An expansion slot can also contain an HP ROM drawer. This is a device for interfacing optional ROMs to the computer. Although the drawer module is the same for the HP-85 and HP-87, the actual ROMs are different for the two machines. Like the HP-85, the 87 has an Input/Output ROM, an Assembler ROM and a matrix ROM. A Plotter ROM is available to control peripheral plotters, and an Advanced Programming ROM for the 87 is reportedly in the works. The Input/Output ROM allows specialized interfacing for data acquisition and machine and

instrument control, using Basic. It's also required for the new HP Modem module.

In the series 80, all machine language programs are implemented as expansions of Basic. You write your machine language routine or function, give it a reserve word to be used from Basic, and simply use the new reserve word (after loading in the binary program) in your Basic program. Binary programs can have several routines and reserved words, and the HP-87 will allow up to five binary programs to reside in memory at one time.

The screen on the 87 is 9-in. wide and 5-in. high. It's more than double the size of the screen on the 85. It will display a standard 24-by-80 character text format, or 16-line display compatible with the number of lines on the 85.

The company has devoted 16K bytes of memory to the screen display. This memory does not come out of the user's RAM, and in its normal configuration, it provides 54 scrollable lines of text and a graphics display with 240 by 400 dot resolution. A special A/G key allows the user to toggle between alpha and graphics modes from the keyboard, or either mode may also be selected through software. The user can also select an all-text or an all-graphics mode. In the all-text mode, 204 lines of scrollable text are available. In the all-graphics mode, resolution improves to 240 by 544 dots.

One disappointment is that HP does not offer a color graphics option with the 87. This void is somewhat offset by the easy use of HP Basic for graphics, especially when drawing charts and graphs.

The screen controller chip is different on the 87, and it offers noticeably faster screen displays than on the 85.

A version of Visicalc for the 87 that will use all of the machine's memory capacity is offered. It can

also use all of Basic's internal functions in formulas on the spreadsheet and comes with an assortment of special graphing programs that allow translation

HP claims that any generic CP/M program can work with the 87... literally thousands become available.

of Visicalc results into bar or circle charts. HP recommends that Visicalc 87s have at least 32K bytes of extra, plug-in memory.

A Data Communications Pac for interfacing the 87 to another computer or an acoustical modem is also offered. A Graphics Presentation Pac provides alternate typestyles and enhanced line and arc drawing capabilities for charts, graphs and other

visual materials. Many of the Pacs for the 85 are upgraded for use on the 87. These include Statistical Analysis, Linear Programming, Financial Decisions, Surveying, Games and Electronics Engineering.

Third-party software vendors have already announced software packages for the 87, and several more are planned. Many are upgrades to existing 85 packages, but several that will only run on an HP-87 are reportedly planned.

With the CP/M module, literally thousands of programs become available to the 87 user. HP claims that any generic CP/M program can work with the 87. However, it is specifically stated that the Word/125 and Link/125 software products designed for their HP-125 CP/M computer are not generic, and won't work on the 87.

The 87 uses the same bottom plate as the 85, so it takes up about as much table space as an electric typewriter. With its larger display, the 87 is taller than the 85, and the user should take into account that the 87 needs an external disk drive and (for most applications) a printer in order to come up with a useable system. Weight is approximately 22 pounds.

The microprocessor chip used in the 87 is the same one used on the 85, but works in conjunction with a custom memory management chip. This means the internal processing speed of the 87 is slightly slower than the 85, because of the overhead involved in memory management.

To offset this, the new screen controller chip used by the 87 is about four times faster than the 85's, and the disk performance has been improved. With the large memory potential, there's also less need for program chaining or disk access. HP claims that these trade-offs result in performance that is roughly equal between the two systems. However, in discussing the new computer with two of HP's independent test-sites, both test-sites stated that the faster display and disk access resulted in increased performance for the business and engineering programs they were developing for the 87. Obviously, the performance of the 87, when compared to the 85, will depend on the nature of the program being run, but programs with interactive screen displays or disk access should be faster on the new 87.

Price of a complete system (as pictured) is \$5,490 (\$2,495 for the HP-87, \$2,200 for the dual disk drive and \$795 for the printer).

The HP-85 will continue to be manufactured and sold as a portable personal computer that is fully integrated with a printer and mass storage device. The HP-87 now gives the series 80 line an upper-level, larger capacity machine for more ambitious projects. □

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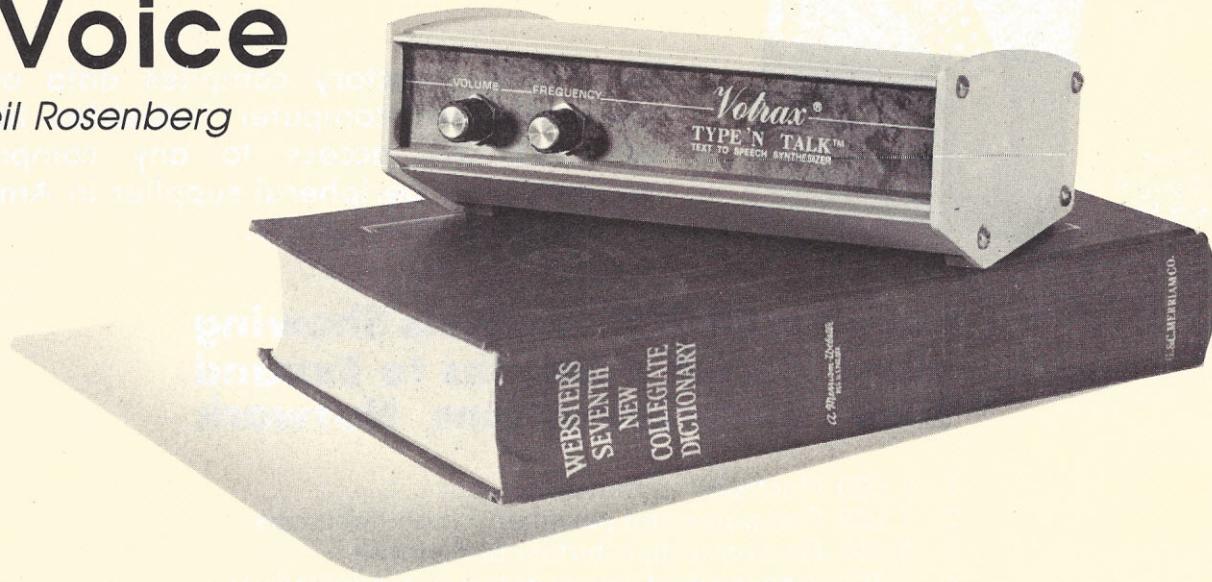
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The Votrax Type'n'Talk: Give Your Computer a Voice

by Neil Rosenberg



The Type'n'Talk speech synthesizer by Votrax (Troy, MI), priced under \$400, is about the size of 1½ pocket calculators. By means of a simple RS-232 interface, one can create fully formed, fully understandable speech by sending unmodified ASCII text to it.

Inside a sturdy extruded aluminum case, one finds a single pc board with several interface and memory chips, the SC-01 phoneme generator and a potted area (for software security), which contains a Motorola 6800 series micro joined with a 4K-byte PROM. In this PROM are all the algorithms for converting standard text to phoneme data. Many rules for proper speech are obeyed, yielding comparatively natural sounds and correct pronunciation.

On the front panel are the unit's two controls, one for frequency and speed of the speech—the other for volume.

Although the unit contains no internal speaker, it does have a built-in amplifier for driving an external 8-ohm speaker to more than adequate volume. On the rear panel is a standard DB-25 (female) connector, an input jack for the power cord, and a coaxial phono jack for the audio output. Also present on the rear is a rectangular cutout, which provides access to a DIP switch for baud rate selection, adjustable from 75 to 9600 baud.

No problems were experienced in interfacing this product to a normal serial port—except the usual pilot error. Within a couple of hours, spent mostly making cables and procuring a speaker, I had the unit repeating back to me everything I

typed at my terminal. No software is provided, but thanks to Microsoft Basic's MID\$ command, the accompanying program was easy to write.

```

10 REM PORT IS OUTPUT PORT TO TYPE'n'TALK
20 LINE INPUT TEXT$ 'INPUT STRING TO BE SPOKEN
30 FOR POINTER = 1 TO LEN(TEXT$)
   'SEQUENCE THROUGH LINE
40 OUT PORT, ASC(MID$(TEXT$, POINTER, 1))
   'SEND ONE CHAR.
50 FOR DELAY = 1 TO 20:NEXT
   'OPTIONAL IF NEEDED
60 NEXT POINTER
70 OUT PORT, &H0D 'SEND CARRIAGE RETURN
80 GO TO 20

```

The first thing heard after properly connecting the device and powering it up is "System Ready," after which it awaits data to pronounce. The voice is a monotone. After a little experimentation with the frequency knob, one can tune a pleasant speaking tone. The range of adjustment is large, with a slight peculiarity in the control: as you turn it clockwise, the frequency decreases, the opposite of what one would expect. The tone can be manipulated from a positively gravelly-sounding rumble to a fast high pitched mousy voice. The upper and lower limits are beyond reasonable sound.

The unit has three main operating modes that can be selected under software control. The first one (the power-up condition) speaks words, where a word is defined as a continuous string of alpha

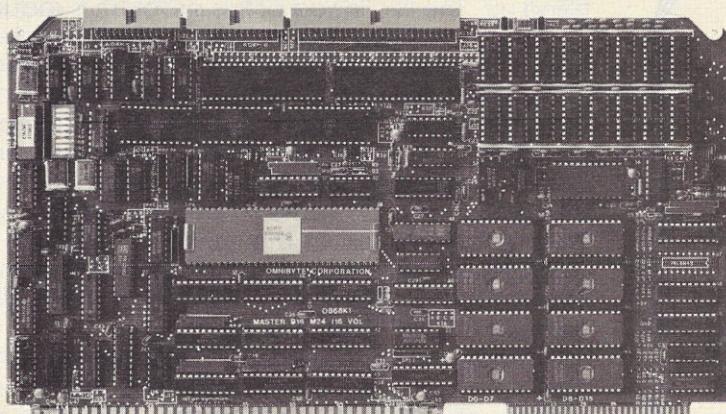
characters preceded and terminated by a space or a period. In this mode, the algorithms are put to work, analyzing the context information within each word, and outputting the proper phoneme sequence. If it encounters individual letters surrounded by spaces, it speaks the letter as if it were recited from the alphabet. The string OK would be pronounced as "ahk" and O K as "oh kay." Numbers are always pronounced as individual digits. If the data contains an imbedded period just preceding a number, it is spoken as "point," thus properly interpreting it as a decimal point.

The second mode speaks all characters as individual alphabet letters, regardless of word grouping. The third mode (for more advanced users) is direct phoneme input. It resembles functionally the unit Radio Shack markets for the TRS-80, which is also a Votrax product. Although this would appear to be a more capable mode for accurate reproduction, most of this functionality of direct phoneme control can be accomplished in the first mode by careful manipulation of word spelling. This is an intuitive process, which isn't difficult once you get the hang of it. For example, the word computer is not spoken well by the device in mode one, but by respelling it to cum pewter it comes out quite well. Note that it has been split into two words. This

forces the unit to pronounce the "y" sound in pewter as "pyuter," whereas if they were joined as one it would sound like "cumpooter." The best way to develop a rapport with the tool is to sit down and experiment.

Not all sounds are perfectly formed; some are deficient. For example, the letters G, H, and L, when spoken as parts of words, are too short in duration and lack strength. Also, when speaking individual alphabetic letters, such as D, P, T and others that end with the "ee" sound, the pronunciation appears to be almost two-syllabic, with a slight hump in amplitude when going through the transition from the particular consonant sound to the "ee" follow-through. It has been pointed out that learning to understand this unit, as with many other synthesizers, is much like learning to understand a person with a foreign accent. Because pronunciation is the same each time for similar circumstances, one quickly gets to know the quirks. The Type'n'Talk is even easier than most due to its well-designed algorithms.

The various supply voltages are delivered to the Type'n'Talk directly through a multi-conductor line from an independent plastic module. The supply runs fairly warm to the touch, and AC is permanently live on the primary. Thus the power switch is low-voltage DC oriented. No other cables are supplied



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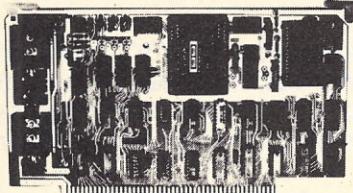


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with the unit, so be prepared to have on hand an RS-232 cable and a miniature phone plug with two conductor wires to a speaker.

Although the manufacturer data claims a conservative 750-character buffer, 850 to 900 characters can be held at any one time. The way it handles data is as follows: When the power is turned on, the buffer is empty. As data is input, it is written into the 2114's. As soon as a carriage return is experienced, it moves about 125 bytes, or all of the characters—whichever is less—into an output holding area for processing and speech. If you send 125 bytes, followed by a carriage return—then 750 bytes—you will have effectively used all of the memory. Unfortunately, this is slightly less than the 1,024 needed to do a complete screen dump from a 64-by-16 video screen.

Proper timing will reduce overrun

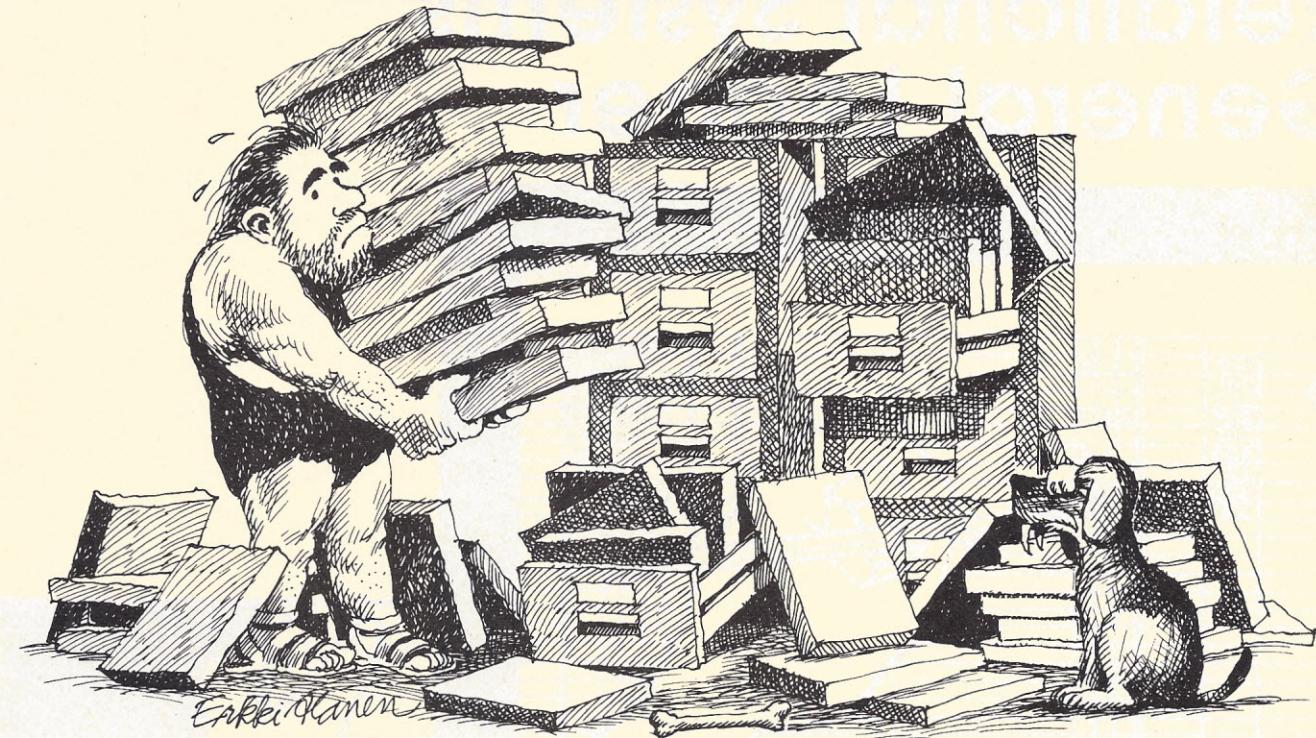
The interface protocol requires the use of CTS (clear-to-send) to ensure against buffer overrun. This is somewhat inconvenient as compared with XON, XOFF used by many terminals, since it requires that a port service this status like a parallel bit. This is not a major problem because the buffer is quite large, and if you are careful in your software timing, it will be able to speak all of the desired text without filling up. The likelihood of this problem is reduced by using the lower baud rates. Unless batch-text is sent, there is virtually no output speed difference.

The user's manual is brief and does not include a circuit diagram. Votrax contends that the company will soon be publishing the non-confidential portion of the schematic. This will indeed be a help. In the interest of brevity, some important details have been omitted such as the polarity of the CTS line during busy and not-busy conditions. Measurement shows that the line is +12 volts when the buffer is not full, and -12 volts when it is.

By incorporating a unit-assignment code (address), one can daisy chain several Type'n'Talks, and individually access the devices. One can also communicate bi-directionally with the product, and get from it the phoneme data for the words given to it. This enables the user to fine-tune a word with minimal effort. Because it is a monotonic device, the human quality of the speech is somewhat limited. Votrax claims to be considering production of a software inflection-controlled device. By evidence of this superior product, it appears that the consumer-available synthesizer has finally reached its day. □

Neil Rosenberg holds a Masters degree in Product Design/Engineering from Stanford University, and an Architectural degree from MIT. He is currently employed as Engineering Manager at Integral Data Systems, a matrix printer manufacturer in Milford, NH.

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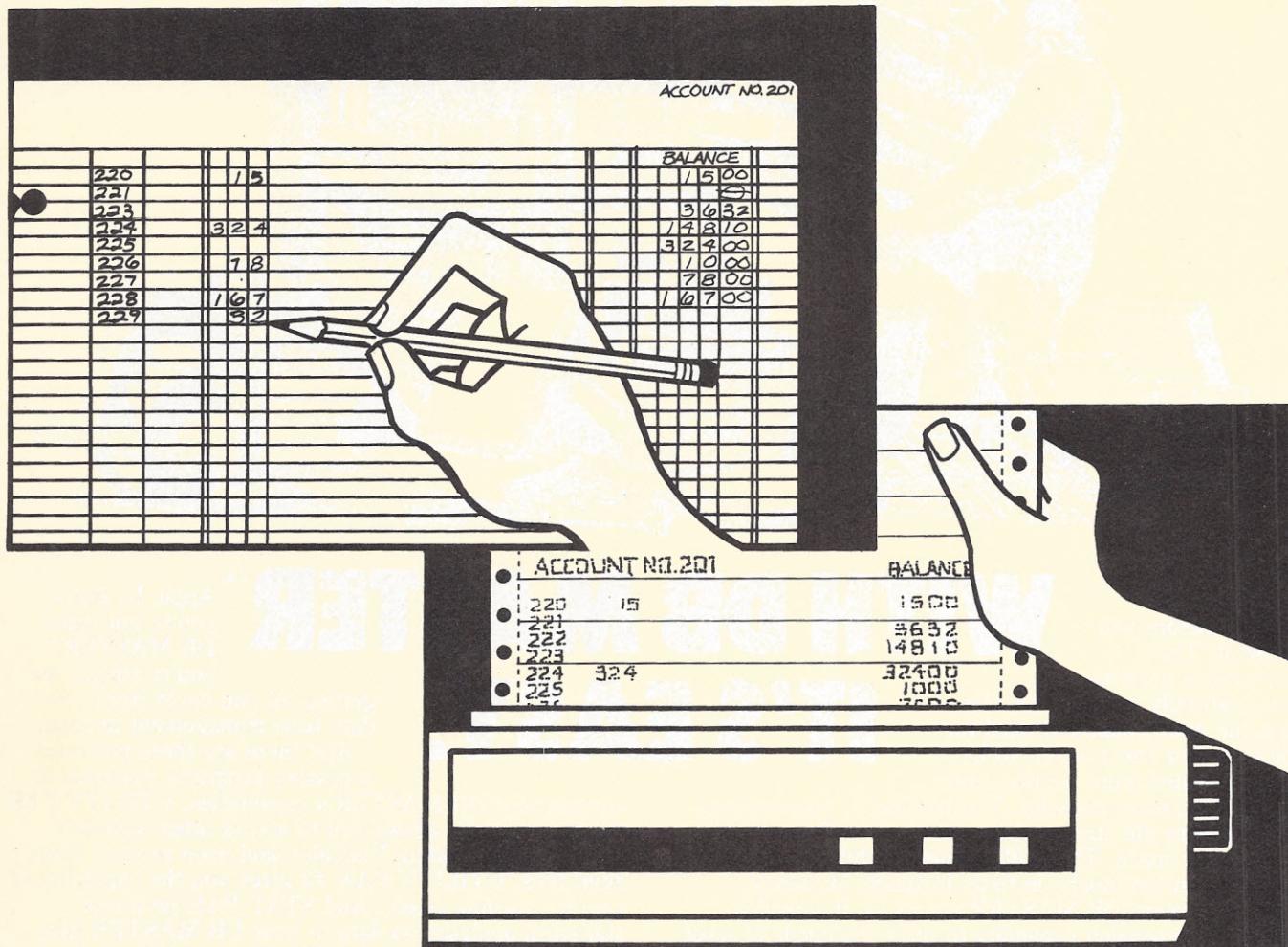


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201 ACCOUNTS 32 JOURNAL
MAINTENANCE

Relational Systems' General Ledger



by Carl Heintz, CPA

Relational Systems (Salem, OR) introduced one of the first practical program generators for micros—the acclaimed Pearl series. Recently, the company has expanded its product line to include a complete set of accounting software.

The Relational Systems general ledger is designed to run on a Z80-based computer, or one that supports CBasic, version 2.06 or higher.

The user must furnish a sort program, either QSort (Structured Systems, Oakland, CA) or Ultrasort. The system needs two disk drives, with at least 60K bytes per drive, and at least 48K bytes of RAM memory. The capacity of the system is limited essentially only by the disk space. With the charts included in the manual, one may calculate the maximum configuration of a system. On a 100K-byte disk, for example, it is possible to get 917 general ledger master file accounts—and up to 1,470 current journal entries. When everything is considered, however,

a typical small business with up to 640 accounts and 1,280 transactions would need 153K-byte disks. Hard disks are supported too, and the system can support multiple companies or clients.

The documentation is about 200 pages long—mounted in a three-ring binder. It includes a rather lengthy tutorial section, which leads the reader through the software step-by-step, with samples of what the screens look like and an explanation of the program operations. The manual contains examples of most of the printouts and reports. (I chuckled a bit about one flaw—there's a balance sheet illustrated that doesn't balance!) The documentation contains several checklists; a step-by-step set-up procedure assumes the reader is neither an accountant nor a computer whiz.

The programs are written in CBasic, which means that the programs that run on the machine are compiled and are not human-intelligible. Such an approach ordinarily protects the software vendor to some degree from software piracy, but it also makes modification impossible. It was refreshing to see that the company has foreseen the problem and includes the human intelligible source code too. A user receives two sets of disks—those for the machine and those that contain the uncompiled original source—for documentation and modification.

Aspects of data entry

The source code itself is easy to understand. Many software vendors that supply code contribute such sparse comments that it is difficult to see what's happening—not so with this code. It is well-documented, with plenty of remarks throughout.

While CBasic is an acceptable language, it is one of the slowest-running dialects of Basic. By comparison, Microsoft Compiled Basic is 10 to 15 times faster. One notices the difference in the operation of the programs, especially in the times necessary to put screens up and make calculations. While there is a speedup program available for CBasic called CB-80, it is not part of this package.

The heart of any general ledger system is the data input sequence. That is generally where most of the operator's time is spent—it is essential that the procedures are designed to accommodate production.

The designer must balance the extra complexity of operation and the extra processing time required against the marginal user benefit from added features. Relational Systems designers have developed a compromise that should satisfy most users. The system does account-checking and validation. This can be somewhat of a time-consuming task with

a slow disk system (half a second or so for each journal entry), but the benefits far outweigh the disadvantages, since garbage is kept out. The journal entry process always results in the display of cumulative total debits and credits, further making errors easier to detect and correct—or prevent. This general ledger also has an option called batch entry, which is good enough to satisfy any speed demon. It allows for the entry of an entire journal entry, one to a line, with individual fields delimited only by commas. This entry sequence is extremely rapid and ideal for those clients with exceedingly large transaction volumes.

Messages can be selected

There is another nice data entry feature rarely seen in an application program before. The user can select various levels of system messages—from almost no messages to a full-blown state where anytime a file is opened or a disk is accessed, the system tells you what it's doing. This instructs and informs, and gives the operator something to read while the system is doing its thing. The programmer would find it valuable in debugging a modification to the programs.

Once information has been entered, it can be edited or deleted. Before posting, the journal entries can be printed out. Once posting has begun, the process is repeated as a control, and the operator gets a list of all journal entries posted.

The issue of cumulative versus balance brought forward has sparked debate between accountants and computer programmers. In most general ledger systems, the system loses all of the prior month's detail each month when the user does a monthly close and only the summary totals are brought forward. The Relational Systems solution is to create a cumulative journal file that has all of the entries on it—generally put on a separate work disk so as to not overwhelm the regular system.

Much of the feel of a general ledger system can be obtained from an examination of how the system chart of accounts works. Relational Systems' chart coding structure provides for six-digit account codes, two of which are cost centers. The first digit is fixed by the system and establishes the nature of the account, as shown in figure 1.

The user sets up the financial statements by coding accounts, which are designated as title accounts, balance accounts or summary accounts. The user might set up an account coding similar to that shown in figure 2.

In this example, only the accounts that had a number in the fourth digit of the account code

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(____ X . ____) would be balance accounts. The remainder act as title accounts or summary accounts into which the detail from several accounts is combined for presentation on the financial statements.

There are both advantages and disadvantages to this system. On the one hand, it provides an easy

0000.00	Assets
1000.00	Liabilities
2000.00	Owner's Equity
3000.00	Income
4000.00	Expenses
5000.00	Income Taxes

Figure 1. Six-digit arrangement

4000.00	Expenses
4100.00	Operating Expenses
4110.00	Labor
4111.00	Office Labor
4111.01	Office Labor, Department 1
4111.02	Office Labor, Department 2
4112.00	Other Labor
4120.00	Supplies

Figure 2. Example of account coding

Sales	24,000.00
Less: Cost of Goods Sold:	
Beginning Inventory	12,000
Purchases	10,000
<hr/>	
Total Goods Available	22,000
Less Ending Inventory	10,000
<hr/>	
Cost of Goods Sold	12,000.00
<hr/>	
Gross Profit	12,000.00
<hr/>	
Less: Expenses	
Rent	1000.00
Computer	50.00
Etc.	

Figure 3. Income statement

set-up of the financial statements by allowing the user to code his chart and establish the financial statements at the same time. This scheme is somewhat limiting. The system forces a user to adopt the computer's approach to charts of accounts. It also imposes limitations on the ability to add accounts. A user is physically limited by the number of sub-accounts that can be consolidated into one summary account—10 is the limit in most cases.

Further, the system is somewhat limited in its ability to format the financial statements. The user has no control over the number of columns. The system does not allow for any subtotaling. Consider the income statement in figure 3.

This example is not an unusual requirement for a suitable income statement format. Unfortunately, it is impossible to achieve with either the Relational Systems software or other programs that use the "account formatting" routine. One needs a report writer. For most applications, however, the account coding structure provided is adequate—and should comply with most applications.

A nice feature of this system is the way in which it handles cost centers and departments. The system allows up to 100 departments that can be used for the income statement and the balance sheet. Thus, the user can construct divisional balance sheets.

The chart of accounts defines reports, but there are other considerations. For example, consider the task of rounding-off cents. The Relational Systems programs do not do this. However, the source code is available, and it is possible to modify it to be the way you want it. The account names can only contain 25 characters. This limitation extends to the financial statements. (Just about every general ledger system available has similar limitations.)

Strong interfacing potential

One notable feature of the system is the ability to select either a wide form report showing current period and year-to-date or a narrow form that shows only the year-to-date activity.

As mentioned, the Relational Systems general ledger interfaces to a number of other programs, including a payroll system, a receivables system, a payables system and an inventory system. That's not all, though. Using Pearl, one can generate custom applications programs that can be interfaced to the general ledger with a little ingenuity. From the standpoint of interfacing, the general ledger has excellent potential.

Generally, this package has few drawbacks. It is thoughtfully designed and executed. It is flexible and well-suited to most businesses, though a little ingenuity may be necessary in financial statement formatting. □

Contributing editor Carl Heintz has spoken on microcomputers before discussion groups of the California Society of CPAs. He has taught accounting at both USC and UCLA and received undergraduate and graduate degrees in business administration from the former. He has made numerous presentations on business topics before civic and business groups, including a series to the American Management Associations. In addition to many articles, Mr. Heintz has two books to his credit.

AUGUST 1982

how the Data Princess became a Queen

a tale about ACCESS/80 from Friends Software



Princess DataStar¹ had a lot of magic powers. She could manipulate huge amounts of data fast and accurately. She could create forms and help produce personalized mailings. ¶ But Princess DataStar could not write reports. And this made her sad. What good was all that data if she had no easy way to answer questions about that data? Princess DataStar cried and cried. ¶ One day, a handsome young man suddenly appeared. "Don't cry, princess," he said with a bow. "My name is ACCESS/80 Report Writer. I can generate reports directly from your existing files—and, I might add, from any other files in industry standard ASCII character format." ¶ "You can?" she asked. "How?" ¶ "It's simple. Even a non-programmer can use me to quickly generate virtually any report using just one easy-to-write statement that resembles ordinary English. I can be used for a myriad of applications. I'm field-proven and I'm easy to upgrade." ¶ "You're so powerful!" she cried. "You must be expensive."

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BPSXREF: A Cross- Reference Generator

by Alan R. Miller

A cross-reference generator is available for MBasic and Bascom source programs. The program, BPSXREF, was written by BPS and is available from Westico (Norwalk, CT).

High level languages such as Fortran and Pascal recognize three types of variables: global, local and dummy.

Global variables are available anywhere—in the main program or in any subroutine or procedure. All variables defined in the main program of Pascal are global. Global variables can be defined in Fortran with the Common statement. Variables defined in a subroutine can be used anywhere within the subroutine, but they are not available to the calling program.

Dummy variables are used to define the parameters of a subroutine, procedure, or function. They are replaced by the formal parameters when the subroutine is called.

The differentiation between global, local, and dummy variables is extremely useful. For example, suppose the need to sort the array X. A Fortran subroutine for such a task might begin like this:

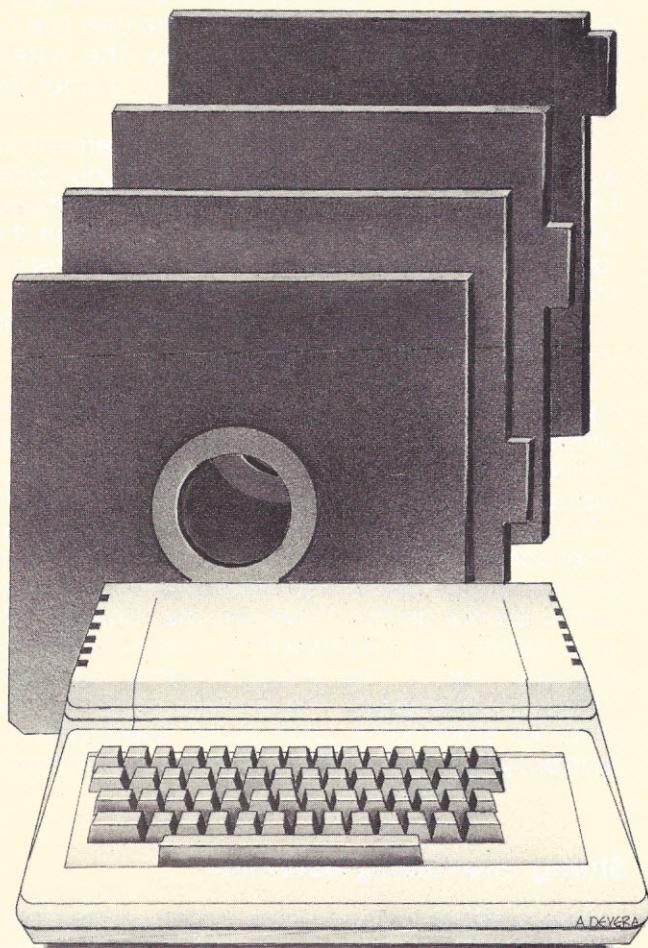
```
SUBROUTINE SORT(X, LENGTH)
DIMENSION X(LENGTH)
```

The main program can call the subroutine to perform the sort. The statement could be

```
CALL SORT(X, LENGTH)
```

However, the variables X and LENGTH in the subroutine are dummy variables. They are different from the variables X and LENGTH in the calling program.

Suppose it is necessary to sort the array Y of length N later in the main program. It is not necessary to write another subroutine for sorting the array Y. Subroutine SORT can be used again, since its parameters are dummy variables. The statement



CALL SORT(Y, N)

will do the job. During execution, the dummy parameter X in the subroutine will be associated with the array Y in the calling program. Similarly, the dummy parameter LENGTH will correspond to the value N.

Within subroutine SORT, there will be loops such as

```
DO 20 I = 1, LENGTH
```

that require a loop counter, I in this case. The loop counter, I, will take on values of 1, 2, etc. The calling program may also use the symbol I. However there will be no conflict since I is a local variable. Thus if I has a value of 25 when subroutine SORT is called, it will still have that value when control returns from the subroutine. Symbols can be readily chosen for use in subroutines, without considering whether the main program is also using the same symbol.

Basic is similar to Fortran. However, all Basic variables are global. A subroutine written to sort the array X of length M cannot be called to sort an array Y of length N. Either the array Y must be copied into the array X before calling the sorting routine, or there must be two sorting routines, one for X and the other for Y.

If the loop counter in the Basic sort routine is I,

400 FOR I = 1 TO LENGTH

then I will be assigned values of 1, 2, etc. If the symbol I is also used by the calling program, the original value will be lost. It is extremely important to have a master list of all symbols in a Basic program. Whenever a symbol is required in a subroutine, it must be carefully chosen.

The writing and revising of short Basic programs is relatively easy. Basic is usually implemented as an interpreter. Therefore, execution can be stopped at any point. The values of selected variables can be printed out or even changed; then execution can be continued. However, as the program increases in size, so does the number of variables. It is necessary to carefully organize the naming of variables so that there is no conflict. One common technique utilizes the same initial or final character for all variables in a subroutine. This is easily done in MBasic and CBasic since symbols are allowed to be as long as 31 characters.

What is needed for all but the shortest Basic programs is a cross-reference generator. Such a program will arrange all of the symbols in alphabetical order. The line number for each reference to the symbol will be given immediately following the symbol. When a new symbol is needed, the cross-reference listing can be consulted, to be sure that the symbol is not already in use.

A cross-reference listing will also help in finding programming errors. For example, suppose that the loop index is misspelled at one point. The programmer meant to type:

100 FOR I = 1 TO N
110 X(I) = I

but instead entered a J rather than an I on line 110:

100 FOR I = 1 TO N
110 X(I) = J

If the symbol J is not defined anywhere else in the program, it will have a value of zero. This error can be easily found by reference to a cross-reference listing. Each symbol will normally appear at least twice in a program. It will be defined on one occasion, then used on another. But in the case of typographical error, the symbol will only be referenced once.

A similar problem may occur during program revision. Suppose that a symbol needed in a previous version is no longer used. If the symbol definition is not removed, the program may work properly, but there will appear to be more symbols than are necessary. In both of these examples, there is only one reference to a particular symbol. Thus, if a cross-reference listing is available, these symbols will only appear once in the listing.

CBasic (reviewed IA Sep 81) has some features that differ from Basic. Specifically, it is not necessary

to begin each line with a line number. Line numbers are only needed as labels for branching. Another feature of CBasic is a cross-reference generator.

Microsoft provides two versions of Basic for CP/M—MBasic is interpreted, and Bascom is compiled. Programs written under the guidance of MBasic can be saved on disk in a short coded form. The command is

SAVE "NAME"

where NAME is the filename chosen by the programmer. MBasic creates a disk file named NAME.BAS. Saving Basic programs in the short form requires less disk space, and the process of copying the program from memory to disk and back speeds up. However, the encoded form cannot be altered by a regular text editor. Furthermore, the program cannot be run by Bascom.

MBasic programs can also be saved in ASCII form. The command is

SAVE "NAME",A

This will create a filename NAME.BAS, just like the previous command. However, the program will now be saved in pure ASCII form. To avoid possible confusion between the ASCII form and the non-ASCII form, it is common practice to assign the ASCII form a filetype of ASC. This is accomplished with the command

SAVE "NAME.ASC",A

MBasic can read a previously saved program whether it is in the ASCII form or not. It is not necessary to tell Basic which form. The command is the same in either case

LOAD "NAME"

or

LOAD "NAME.ASC"

if the program was saved with the extension ASC.

The BPSXREF program requires that Basic programs be saved in the ASCII format, rather than in the encoded form. Programs can also be written with a CP/M editor. If you write Basic programs with Wordstar, use the nondocument, N, mode rather than the document, D, mode. If you create a Basic program with the D mode, MBasic will usually refuse to read it. If you inadvertently use the D mode, all is not lost. PIP can be used with the Z option to undo the damage. The command is

PIP PROGRM.BAS=PROGRM.BAS[VZ]

Be sure not to use an ambiguous reference. The command

PIP PROGRM.BAS= *.*[VZ]

will destroy your program.

Execute BPSXREF by typing its name at the CP/M command level. Then enter the name of a Basic

program. BPSXREF assumes a default file extension of ASC. In this case, type

PROGRM

to start the program. On the other hand, if you saved your ASCII-encoded program with the normal extension of BAS, you must type

PROGRM.BAS

In either case, only upper-case letters may be used. BPSXREF will not convert lower-case letters to upper. A straight program listing will appear at the CP/M LST: device. This is normally the printer. Formfeeds are automatically added to skip over the folds in the paper. The cross-reference table follows the program listing.

Several optional features can be chosen. They are given after the filename and are preceded by a slash. The options are

- /P Print Basic program but not cross reference
- /X Print cross reference but not Basic program
- /N Emulate formfeeds with linefeeds
- /F Make a disk file for the output (of type LST)
- /M Indicate multiple occurrences on same line

These options must be entered in upper-case letters. More than one option may be selected (although /P and /X are mutually exclusive). The options may occur in any order. A space must precede the first option. Thus the command

PROGRM.BAS /N/M/F/X

will create a disk file named PROGRM.LST containing only the cross-reference listing. Extra linefeeds will be included to emulate formfeeds for an 11-in. page. If a symbol appears more than once on a line, the line number will appear more than once.

After execution of BPSXREF has started, you might forget the actual spelling of a disk file. In this case, you can view the disk directory by giving the command

DIR:

This command can be made more specific by adding a disk drive and the extension BAS. For example, the command

DIR:C.BAS

lists basic files on drive C.

About half the time, a program will finish on the wrong fold of the printer paper. If the next output begins on the next page, you will have to refold the entire output, or fold back half of the first page. The solution is to eject a page before printing the next program. The ASCII at-sign can be used for this purpose. It will tell BPSXREF to move to the next page.

It is good programming practice to make the first line of each Basic program a brief descriptive

comment. With this in mind, BPSXREF reprints the first line of your Basic program on the top of each page, also providing a page number at this point.

One disadvantage of both Basic and Fortran is that parentheses are used to enclose array subscripts as well as function arguments. Consequently, the expression

A = LINE(I)

is ambiguous. The symbol I could be an index into the array LINE or it could be a formal parameter to the function LINE.

In Fortran, all arrays must be dimensioned to establish clarity. In Basic, arrays with a length less than 11 do not need to be dimensioned. This duality shows up in the cross-reference listing. Arrays declared in a DIM statement are listed as arrays and the line number of the DIM statement is given. However, arrays that are not dimensioned are referenced as though they were functions.

BPSXREF can handle up to 200 different variables. If more are in use, an error message is given on the console and the additional symbols are shown on the screen. Perhaps if a program is this complicated, a language such as Fortran or Pascal should be used instead.

The CP/M operating system is not always in control. If you start an executable program with incorrect parameters, it may not be possible to prematurely terminate the program. An executing program can frequently check to see if a console character has been typed. Then the program can be aborted if the ASCII escape is typed. But this feature must be specifically included in each program. Unfortunately, it is not very common. BPSXREF, however, does include this desirable feature. Once execution has begun, it can be terminated simply by pressing the escape key.

I have a collection of very large Basic programs developed over many years. These include Star Trek, Wumpus, a poster program (IA Oct 79), and a program for setting up a gourmet club of 50 members. They all work fine, but I am not sure what variable name to select when I need a new one. When these programs were given to BPSXREF, it readily found variables that were initialized but never used. They were remnants of a prior version. I have put the printouts away for future reference, in case a revision is needed at a later time. If you write long Basic programs, you should have a copy of BPSXREF. □

Contributing editor Alan R. Miller is a Professor at New Mexico Institute of Mining and Technology, where he has taught materials engineering, thermodynamics, and programming methods since 1967. He received his Ph.D. from the University of California in Berkeley. He has authored five books dealing with computer languages.

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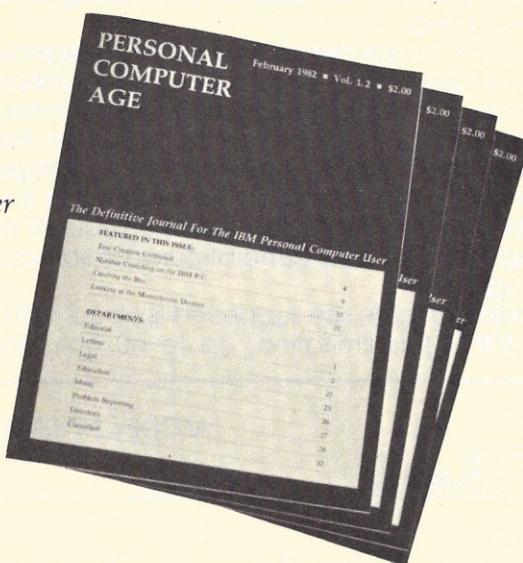
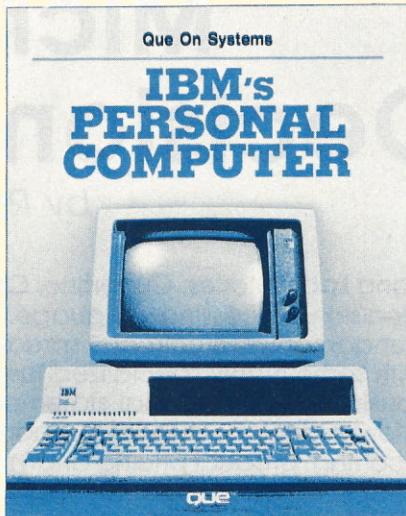
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Microplan: A Decision-Making Tool

by Rocky Smolin

Microplan (Chang Laboratories, Cupertino, CA) is billed as a decision-processing language. It combines the fundamental electronic spreadsheet features with some highly specialized functions aimed at business and financial statement problems: cashflow planning, budget preparation, variance reporting, product pricing analysis, financial report preparation, manufacturing planning, private investment counseling, merger and acquisition pro-formas, capital budgeting and sales forecasting.

The program boasts design features that allegedly make it well-suited to the preparation, manipulation and solution of financial problems. This expanded capability led to some compromises in design. For example, except for the column and row headings, only numeric information can be entered in the tables. As a result, Microplan is less flexible in its formatting than the more general-purpose spreadsheet programs.

The maximum table size supported is about 1,000 entries. Within this limitation, up to 60 columns

and/or 200 rows can be entered. Microplan takes about 120K bytes on the diskette and runs under the CP/M operating system—making it compatible with a wide variety of hardware. A Microplan table occupies about 5K bytes on the diskette. Columns will accept two rows of 20 characters each for descriptive headers and rows descriptions up to 40 characters.

Options for column formatting

Column formatting includes the setting of column width, the number of decimal places in a numeric entry, a dollar sign format and a percent sign format.

For some users, Microplan may initially be more confusing and difficult to use than Visicalc or Calcstar. It is highly-coded. The commands are referenced by number—requiring frequent references to the manual. In standard format, only five columns of figures and seventeen rows are visible. The screen is tightly-packed with status information.

MODE=NORMAL ORDER=R/C ROW=1-50 COL=1-20					
ROW	1	2	3	4	5
1	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0

Figure 1. List of numbered commands

1	FORMAT:
2	DATA:
3	MATH:
4	FINANCE:
5	PRINT:
6	STATUS:
7	HELP
8	
9	STOP
10	UTILITY:
11	PROGRAM:
12	
13	
14	
15	
16	
17	
18	FORMAT:
19	ROWS:
20	ROW TITLE

Microplan's command language is based on the concept of giving each command a number. This allows the user to enter commands directly without having to type them in. The following table lists some of the basic commands. However, many other commands are available, such as ADD, SUBTRACT, MULTIPLY, DIVIDE, NEGATE, INVERSE, INTEGER, ROUND, and so on.

LINESWOD A...

Since the commands are referenced by number, a list of these numbered commands are displayed on the right side of the screen.

However, what is missing is user-friendliness and screen aesthetics is made up for in excellent documentation and special features. The terminal configuration section is simple and effective. Once this is studied, section 1 will introduce the user to the basic operation. This tutorial leaves little to the user's imagination and guides the novice through creation of a five-year projection—demonstrating not only the program's basic operation but also introducing the types of problems to which it can be applied.

In order to display different parts of the table in the 5 column by 17 row window, one uses the ESC key and a number. For example, ESC 2 will display the next ten rows. ESC 6 displays the next four columns, and so on. This method of displaying parts of the worksheet is typical of Microplan's operation: Until one learns the escape sequences, one needs to refer continuously to the manual. Most users will probably invent their own command summary card like those supplied with Scripsit or Visicalc.

There are 127 commands—all referenced by number. They are grouped as FORMAT, DATA, MATH, FINANCE, PRINT, STATUS, and UTILITY.

Under FORMAT, one can enter and change row and column titles. The type of row and column, underlining, decimal places and special formatting can be specified. The current options and commands stored for each column and row can be displayed and re-ordered.

Several DATA commands

The DATA commands allow selection of a column or a row for data entry. There is a command to allow entry of values with options to make the value constant, grow or increase. Cursor keys allow individual insertion. Another command allows entry of a formula referencing a row or column, values or positive constants. The PLUG command uses a formula to calculate results for a particular cell. FIX recomputes the current row or column and NULLIFY nullifies a command associated with a row or column.

The MATH commands include ADD, SUBTRACT, MULTIPLY, DIVIDE, NEGATE, INVERSE, INTEGER, ROUND,

and so on. The FINANCE commands include CUMULATE, ABSOLUTE, SUM and arithmetic with a constant value.

The FINANCE commands allow specialized operations. SET DEPR prompts for straight line, sum of the years digits, or double declining methods. DEPR calculates depreciation based on the SET DEPR value. One can define mortgages or fixed principal loans and calculate interest schedules. Other commands allow the user to discount cashflows, calculate internal rates of return and percentage ratios. LAG and LEAD shift rows and columns forwards and backwards for cashflow calculations. The

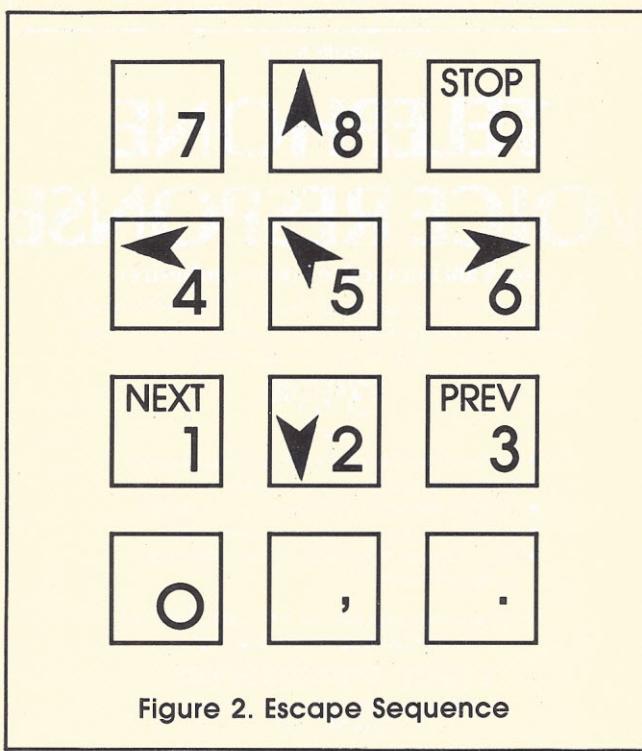


Figure 2. Escape Sequence

commands SET SCHED and DO TAX allow for input of tax tables and calculation of taxes.

PRINT commands set report options and titles and print reports. Reports can be sent to disk files. STATUS commands display range settings, mode selection, and compute order. UTILITY commands load, save, list, print, erase, clear and reset tables.

So far, we have only viewed the capabilities of Microplan with regard to tables of data. One of its most powerful features, however—one that takes it

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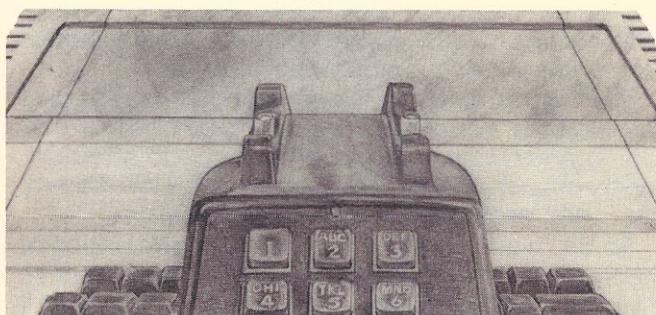
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out of the standard spreadsheet arena into financial modeling/decision-making—is the ability to create programs. A series of commands saved under a program name can be called up and executed by the user. Programs employ the same commands used to do table calculations but can also include commands such as LOAD TBL (load a table from

...A powerful feature is the ability to create programs...

the disk), SAVE TBL (save the table to a disk file) and report generation. With programs, the user can do computations that require more than simple row or column order, develop customized models that prompt for inputs, and control models that work with more than one table.

Since Chang Labs did not supply a full evaluation system, it was difficult to examine and test all of the program's functions. The demo copy sent had the save commands disabled, so testing needed to be done in one session. While the program functions looked interesting—as did the ability to work with multiple tables—we were unable to evaluate them thoroughly and could only work with the table supplied with the demo disk.

We were also not supplied with the Tables Module. According to the specifications sheet accompanying the demo package, this module allows consolidation of departmental or divisional budgets, will perform variance analysis of budget to actual, and provides an applications link to existing data files.

Microplan's suggested retail price is \$495. The Tables Module is \$195. The program would seem to have few significant advantages over the more popular spreadsheets on the market. However, those requiring specialized financial capabilities might find the package an attractive alternative. □

Contributing editor Rocky Smolin is owner of San Diego Business Systems (San Diego, CA), a consulting firm specializing in small business and manufacturing systems. He authored the book *How To Buy the Right Small Business Computer System* (John Wiley, New York, NY). He received a B.S. in Business Administration from Bradley University in 1970 and an M.B.A. in Information Systems from San Diego State University in 1974.

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Senior Analyst: Ahead of its Class

by Tony Dirksen

Visicalc (Visicorp, San Jose, CA), more than any other single program, made the personal computer a legitimate business tool. Before it was introduced in 1979, most business people thought personal computers were hobbyist's toys—without much practical value. But Visicalc changed all that. Today thousands of businesses buy a computer just for Visicalc. Thousands more choose a personal computer based on which version of Visicalc serves their needs the best.

For the uninitiated, some explanation is in order. Visicalc was developed by Daniel Bricklin and Robert Frankston, two Harvard MBA students trying to save the time they spent on calculators refiguring worksheets for classes. The beauty of the program comes from its versatile simplicity. Essentially, Visicalc is a giant electronic spreadsheet, with 254 rows and 63 columns. (Only a small portion of the worksheet is visible at any given time, although you can quickly get to any part that you want.) A business person can use the program just like a columnar pad, inserting values into it to determine anything from a department budget to a marketing plan.

Once values are inserted, Visicalc does all the necessary calculations automatically. And you can easily see what might happen if different variables in your model change. Say, for instance, that you're determining the manufacturing cost of an item; including variables such as labor, overhead and the price of raw materials. You might expect any or all of these expenses to change over a year. Using a pencil and calculator with a columnar pad, it could take hours to figure all the possible variations in cost—with the ever-present danger of calculation errors. These difficulties have tended to discourage this type of "what-if" analysis, sometimes blinding businesses to money-making and money-saving options. With Visicalc, you can examine in seconds the effects of changing the different variables, and be confident that the results will be correct every time.

Visicalc has been called a "computer language for the non-programmer." It furnishes a row-and-column framework into which you can insert virtually any type of equation—from business questions to scientific calculations. Because of its versatility, virtually every Apple owner can probably find a way to use the program productively. The Apple III version, distributed by Apple, provides the largest

workspace of any comparable spreadsheet program available on any microcomputer.

But Visicalc doesn't do everything. Since its introduction, several other companies have tried to duplicate the spreadsheet versatility while increasing program capability. (See "Business Software Forum" /A Jul 82.) Most have fallen short of the original. But a new program, Senior Analyst (available for both the Apples II and III), provides a managerial

***Several . . .
companies have
tried to duplicate
the spreadsheet
versatility.***

tool designed to complement Visicalc in your software repertoire.

First, the bad news: Senior Analyst requires a rather fully-configured system. Users of either Apple system need two disk drives; Apple II owners will need a 64K-byte computer (a 48K-byte Apple II with a 16K language card in slot 0). Unlike Visicalc, Senior Analyst isn't intended to provide a universally applicable framework. It's designed specifically for the business professional needing spreadsheet models.

The types of situations in which Senior Analyst might be used over Visicalc include: a multi-manager environment where there's the need to consolidate models produced by different people; large models; data that's examined only occasionally, or when several people within the firm will be working with the same set of data; and complex business calculations, which can take advantage of the built-in library of 20 functions.

Senior Analyst models are developed on "pages" 20 columns wide by 99 rows long. Up to 800 values can be stored on any page and pages can be linked together, allowing large models. Over 10,000 values can be stored on a single data disk; the program allows multi-disk models.

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To develop a model on a page, you supply definitions for the rows and columns, then let the program perform all necessary calculations. (Global definitions can also be established that carry over from page to page.) Titles, subtitles, values or calculation and formatting rules can be entered within the row and column modes.

It's the structure of the calculation rules that make it possible for several people to use the same

It's...like a second-generation planning tool

model. Rules can be defined as simple English-language commands with distinctive variables, so anyone can understand your assumptions. A sample calculation rule, for instance, might read:

OVHD "OVERHEAD" = LABR/4

which says that the variable OVHD, which stands for overhead, is equal to one-fourth of labor costs (LABR, which is defined elsewhere in the model). If a model is used only occasionally, this clear command structure allows one to return to it at any point in the future and understand the logic behind it.

The program allows you to establish values while setting up rows and columns, and to accept inputs while it's performing calculations. With this feature, a real estate office could write a procedure to allow anyone in the office to show buyers how different house prices and loan rates would affect monthly payments. The people using this procedure wouldn't have to learn any details about Senior Analyst itself, in the same way they might use a turnkey program.

Senior Analyst incorporates a set of advanced functions that make it particularly applicable to

business users. These functions allow you to determine net present value; straight-line, sum-of-digits, and declining-balance depreciation expense; compound growth rate. They also allow you to perform linear regression forecasts. All these functions could be created within a Visicalc-type modeling program, but Senior Analyst has them built in to save time for the user and to reduce the risk of error.

Senior Analyst's ability to consolidate models may be its single most distinguishing characteristic. By using the consolidation feature, sales reports from several different parts of the country could be linked together into a single model—even if each office had different line items. Or several groups that make up a single department in a firm could link together financial information to create a budget.

Many spreadsheet programs allow some type of file linkage, but Senior Analyst provides greater flexibility than others. The models being linked don't need to have the same row and column formats. The program can find and combine the common points of different models. It can also pull information from an existing model or group of models to create a new one.

Once a model has been generated, the entire spreadsheet can be printed. A special "spooling" option allows a multi-tasking capability, so that you can concurrently print while entering data into a new model.

Is Senior Analyst a replacement for Visicalc? Not really. It's more like a second-generation planning tool, that takes the spreadsheet concept into several new applications. It's not as universally versatile as Visicalc, and probably not as good for quickly cranking out a model. But, as a serious planning tool, Senior Analyst answers many business needs better than Visicalc—or any other spreadsheet program. It's sure to rank among many businesses as the program of choice for spreadsheet analysis. □

Contributing editor Tony Dirksen lives in Northern California's Silicon Valley. He's employed by Apple Computer's Editorial Services Department and serves as managing editor of Apple Magazine. He previously wrote for Sunset Magazine and Books. He was an undergraduate at the University of California at Berkeley, and did his graduate work in journalism at the University of Oregon.

California Computer's System 300

by Roger H. Edelson

System 300 by California Computer Systems (Sunnyvale, CA) sports a formidable 90-lb. chassis and 80-lb. dual disk drive. More than a run-of-the-mill hobbyist computer, the system provides reliable, continuous operation in an industrial/small business environment.

The unit is impressive in appearance—beige and black with a keylock switch in the lower right hand front corner. The large black band that stretches across the entire front of the unit is not simply decorative; it covers a 17-in. by 3.5-in. air filter. The cooling air for the computer is drawn through this filter by two very quiet muffin fans mounted on the rear of the mainframe.

Operational control is provided through the RESET pushbutton and the keylock control switch co-located on the front panel. AC power ON/OFF control is provided by a switch on the rear panel, while the keylock switch is used to enable or disable system reset should the RESET pushbutton be inadvertently activated. This function provides system security integrity for the user in a turnkey environment.

Mounted just to the left of the RESET pushbutton are three unobtrusive LED status indicators. The leftmost device indicates power ON/OFF, the next one indicates power failure and return. The final indicator lights if the computer is in a HALT condition. The Power Fail indicator is part of a unique CCS feature that permits saving the operational status of the computer system in the event of a power failure. Should AC power be interrupted, an unmaskable interrupt is generated by the falling power source, allowing 17 μ s for system storage functions. When power returns, the system responds by lighting the POWER FAIL indicator such that the operator is notified of a power outage and can take appropriate remedial action.

The professional motif continues around to the rear of the computer, with the fans mounted on the lower portion, and the I/O connectors arrayed along the top edge. It is nice to have rear panel mounted connectors for the two RS-232 serial ports, the parallel port, and the disk drive rather than having to carry the cables over to the cards. Besides the connectors already in place, the rear panel has

Feature	
bus structure	S-100
memory	64K bytes
memory speed	200ns
hardware vectored interrupt	yes
calendar/clock with battery clips	yes
real time clock	2 (4)
serial channels	2
parallel channels	1 (2)
DMA transfers	std
power fail detect	std
slots	19
table top	yes
cabinet mountable	yes
standard power supply	30 amp
dual floppy disk subsystem	1.2M bytes or 2.4M bytes
disk subsystem—Winchester	std
CP/M operating system	opt
OASIS operating system	opt
test/diagnostic	std

() indicates system total;
accompanying item is user-available/system configuration
std—standard
opt—optional

Figure 1. System specifications

pre-punched locations for a hard-disk connector, six additional DB-25 pin connectors, as well as spaces for two more 50-pin and one more 36-pin flat cable connector.

Once the computer cover is removed, one notices that it is just an outer cosmetic glove used to hide the various supporting screws and cover some of the unsightly seams. Once the inner cover is off, a glimpse of the interior product design can be obtained.

Layout is quite professional, indicating that the product designers had been paying careful attention to the major flaw of most S-100 computers—air flow and cooling. In this system, the cards are positioned at right angles to the front panel with its huge air filter. In this orientation, filtered cooling air passes immediately over the cards, which are

placed parallel to the air flow. Many systems force either a 90-degree turn in the air path, or try to move the cooling air through the cards. This box is well-sealed so that the air must enter from the front, through the filter, and then pass over the cards. An additional surprise was the completely separate power supply cover and filter. This unit was built to withstand continuous service in an industrial environment.

The system uses a motherboard with signals fully shielded by a ground plane for low noise coupling and radiation, and active voltage terminations are provided to eliminate signal ringing. Two +8 Volt supply lines run to the motherboard. The use of dual supply lines minimizes the voltage drop in the main logic supply voltage and increases the resistance to brownout-induced low voltage conditions. To increase the noise immunity of the system, the two +8V. lines are brought to separate areas of the motherboard, thereby reducing the current density (and voltage drops) in the motherboard traces. The modular power supply will provide 30 amps—sufficient for almost any application.

There are only four S-100 Bus compatible cards nestled towards the front of the 19-slot motherboard. All are equipped with ejection levers. The system is shipped with the cards locked down with nylon cable ties. The first of the four cards is the Z80 microprocessor board, which also handles the system I/O. The rear panel connectors for the two

serial ports and the single parallel port are connected to the board through flat cables.

The second board in line is the 64K-byte dynamic memory, followed by the disk drive card. Again, a simple, neat, flat cable interconnection is used between this card and the rear panel connector. The final card contains a real-time clock—which even sports a pair of backup batteries so that the time-keeping function is not lost during power-down or power-outage conditions.

The system is designed for both single and multiuser applications, providing a DMA interrupt structure and a 4MHz microprocessor clock to speed processing and data transfers. Figure 1 presents system specifications and figure 2 shows configuration. The interrupt control is based upon the IEEE S-100 guidelines (as is the system architecture) to assure the broadest possible availability of optional hardware. Data transfers to and from the floppy disk subsystem take place over the standard DMA channel at 500K bytes per second.

The system is based on a Z80 CPU located on the model 2820 system CPU Board along with the I/O circuitry. The serial I/O in the standard configuration supports two RS-232C channels, which may be operated at 110 to 19.2K baud in the asynchronous mode. In synchronous mode, each channel is capable of transmission rates up to 800K baud. As is the case of most full capability RS-232 implementations, the serial channels are double-buffered, and

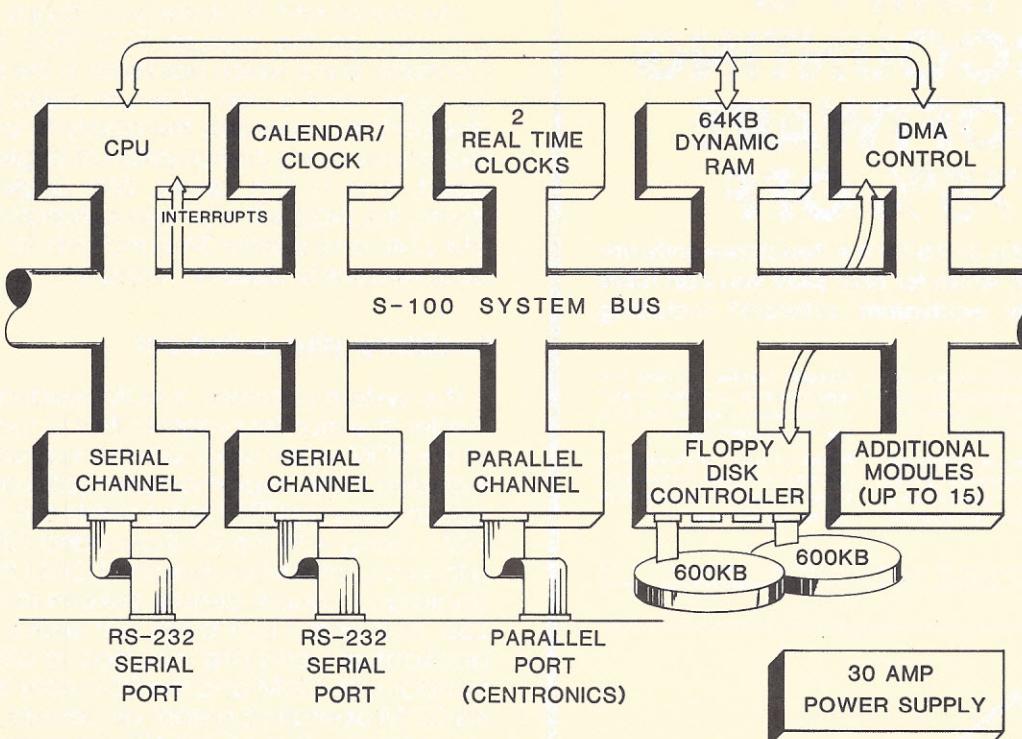


Figure 2. System configuration

allow a selection of 5, 6, 7, or 8 data bits, 1, 1.5, or 2 stop bits, and even, odd or no parity. The single parallel output port provided in the standard configuration is compatible with a Centronics style interface. This port has an 8-bit interface with full handshake control signals, buffering of the signal lines, and an output driver on each signal line to allow flexible peripheral location.

The 64K-byte memory uses 4116 dynamic RAM integrated circuits, and is designed for full conformance to IEEE 696.1/D2 SLAVE F6 T300, while also including circuitry to allow operation in Cromemco Cromix and Alpha Micro systems. The 64K bytes of memory are contained on a single S-100 board. While the system 300 is specified to operate in a 0-55 degree C environment, the 2066 memory module has been designed for operation at a 20-degree higher temperature, to allow for internal heating. The module is composed of a 64K-byte bank with the capability to segment to four 16K-byte blocks. Each block is independently addressable and switchable. Each 16K-byte block may be grouped with any other such blocks across the entire set of memory cards. Four separate 16K-byte blocks from four separate memory banks may appear as a single contiguous 64K-byte bank. This

board gave no problems during hundreds of hours of testing, and has not yet shown any soft-bit errors.

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the system for
hundreds of
hours without a
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each port supporting up to eight memory banks. Both hard (read and write operations disabled) and soft (only the read operation disabled) phantom capability exists, and is selectable by on-board jumpering. Upon reset, or power-on, the hard phantom is disabled to allow reading from external-ROM and writing operations to on-board RAM. The 2066 will revert to the jumper-selected condition when its bank port is activated.

The standard 1.2M-byte dual floppy disk system is based on the mature CCS 2422 Floppy Disk Controller card, which has been in the product line for years, and a pair of single sided 8-in. drives. The 2422 incorporates the ability to control up to four drives in any combination of single or double-sided, 1/4-in. or 8-in. drives. With single sided 8-in. drives, the 2422 will maintain compatibility with the IBM 3740 and system 34 standards for single- and double-density diskette formats.

Bootstrap plus autoboot

The system provides a ROM-resident bootstrap loader (the monitor program that is normally a part of this ROM when used with the system 2210 is not included in this implementation) plus an auto boot option allowing CP/M to be booted on on reset. The 2422 along with the CCS-provided CP/M diskette allows a compatible version of CP/M that supports single and double density diskette formats in 128, 256, 512 and 1,024 bytes per sector. Adequate application notes are included to allow the user familiar with CP/M and the DDT utility to customize his CP/M operating system as desired. The 2422 is compatible with the IEEE S-100 bus standard and will support either Shugart or Persci drive bus configurations. Various mass memory options, including a 2.4M-byte dual drive, dual sided floppy memory or



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hard disk systems with either 10 or 20M-bytes of storage are offered. Options are also available that get you the mainframe and no mass memory, or various combinations of hard and soft disks.

System interconnection was easily accomplished, as the company had included the disk drive interconnection cable along with the detachable three-wire line cords. After interconnecting the 1.2M-byte drive, the terminal, and my printer, it was time to turn on the system power, an action that produced the following message on the terminal screen:

CCS SYSTEM 300
DRIVE NOT READY

Next the CP/M system diskette was loaded into Drive A—the primary drive—and the door closed. After the drive A Activity Light turned on, it was only necessary to press the RESET switch and the system responded by booting CP/M and displaying the system prompt. Using the CP/M DIR command produced a listing of approximately 60 files including DESPOOL (the background print utility) and DIAGNOSTIC II tests. After running the various CPU, terminal, memory and disk-drive tests to assure that the system was operating properly, I loaded in some of my applications programs and began to

use the system. In keeping with the company's proclivity for providing user desirable options, the OASIS operating system is also available.

The CCS system 300 is a high-quality tool. I have used it for hundreds of hours—in many cases running it continuously for 48 hours—without a single failure or any downtime. The unit is now being used as a demonstrator and subjected to the ministrations of various unskilled users. It has not shown any signs of failing reliability. For \$4,995, the CCS system 301 provides a lot of reliable computing power for the price. For those requiring a 2.4M-byte dual-sided double floppy system, the CCS 302 is available for an additional \$300. The CCS 300 and its hard disk (10/20M-byte) cousin, the CCS 400, are available from distributors or directly from the company. □

Contributing editor Roger H. Edelson's experience in the electronics industry has included analog circuitry, analog computation, digital design and, most recently, design and development in the field of microwave communication circuitry. He has been with Hughes Aircraft for more than 20 years, during which time he has been Group Head of the Memory Circuits Group, and Senior Project Engineer with responsibility for the technical and financial development of the F-14 Computer Subsystem.

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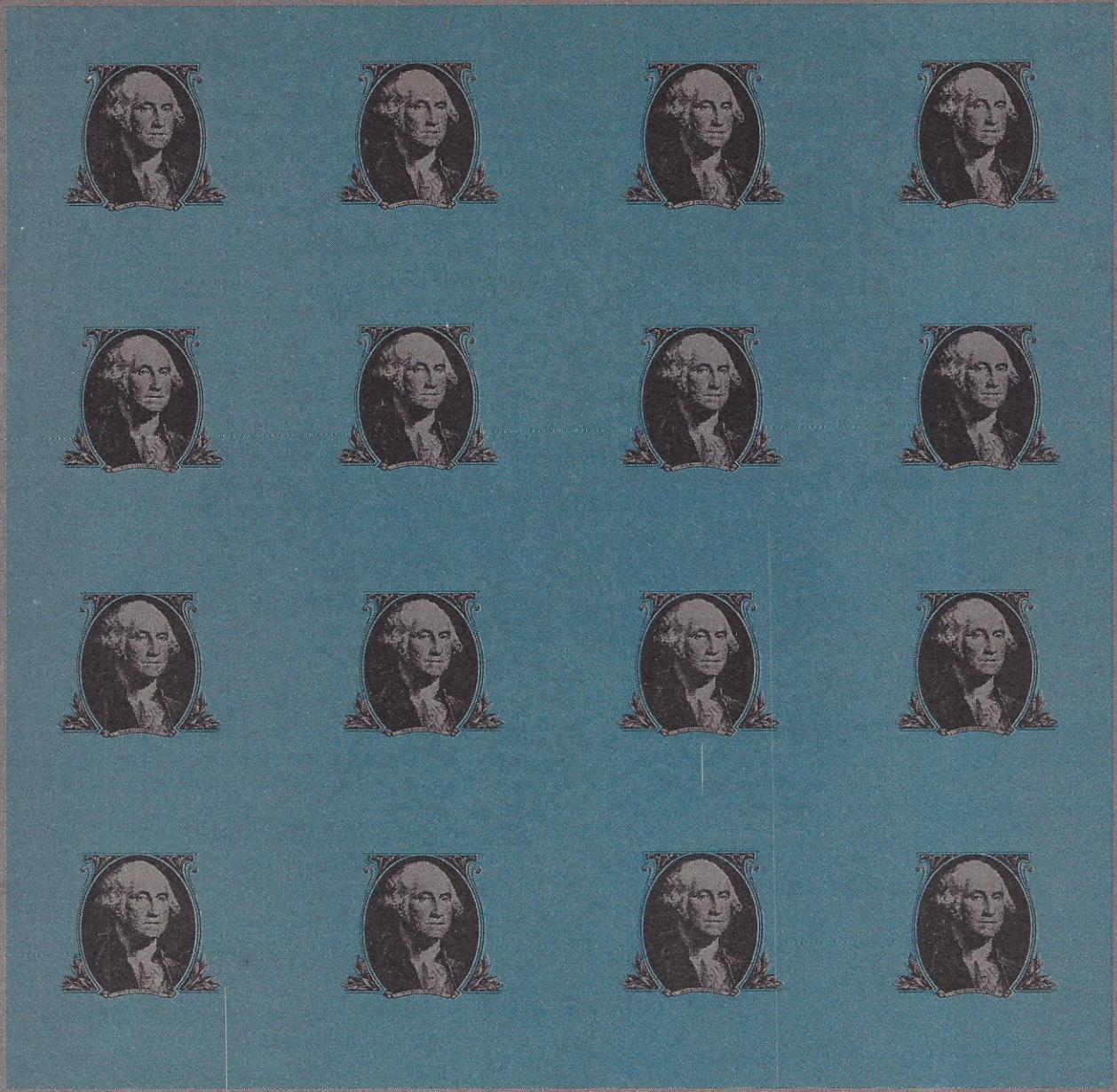
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REVIEW

Assignment: Benchmark

Billings BC-12DF2M



by Hillel Segal

The Billings BC-12 model DF2M computer exhibited average capabilities for its class in the Association of Computer Users' (ACU) benchmark testing, but our telephone survey showed that users were "very satisfied" with their systems.

The DF2M is one of two complete computers manufactured by Billings Computer Division (Inde-

pendence, MO). The firm, about four years old, began as a tributary of Billings Energy Corporation, itself involved in the development of hydrogen power.

Billings' other computer, the BC-12FD, is similar to the DF2M but uses minifloppy rather than 8-in. floppy drives; it is also sold without the drives. Billings

	C-3 Accounts Receivable Time (min.)	Current Price	to be covered in future issues
Billings BC-12 DF2M	5:09.2	\$12,395	SD Systems SD-200
Dynabyte 5300	4:38.0	\$ 7,735	Commodore CBM-8032
NEC Astra 205	5:10.8	\$ 9,890	Smoke Signal Chieftan
Altos ACS8000-15	10:41.5	\$ 9,875	Vector Graphic 3005
Wang 220SVP	2:23.0	\$14,600	Xerox 820
Pertec PCC 2000	6:04.3	\$12,470	IBM Personal Computer
North Star Horizon	1:57.7	\$ 6,911	IBM 5120
Cromemco System Two	2:48.0	\$ 9,275	
Texas Instruments 771	3:38.1	\$12,100	
Vector Graphic System B	5:56.5	\$ 8,995	
DECstation 78	5:04.8*	\$10,495	
Radio Shack TRS-80 model II	3:38.6	\$ 7,609	
Apple II+	6:17.4	\$ 4,330	
Digital Microsystems DSC-2	3:28.8	\$ 9,015	
Ohio Scientific C3-A	15:49.3	\$10,940	
Alpha Micro AM-1011	3:25.3	\$15,605	
Data General CS/10 model C1	**	\$13,400	

*Result includes both compile and run time.

**Time of 2:40.3 was obtained using hard disk system.

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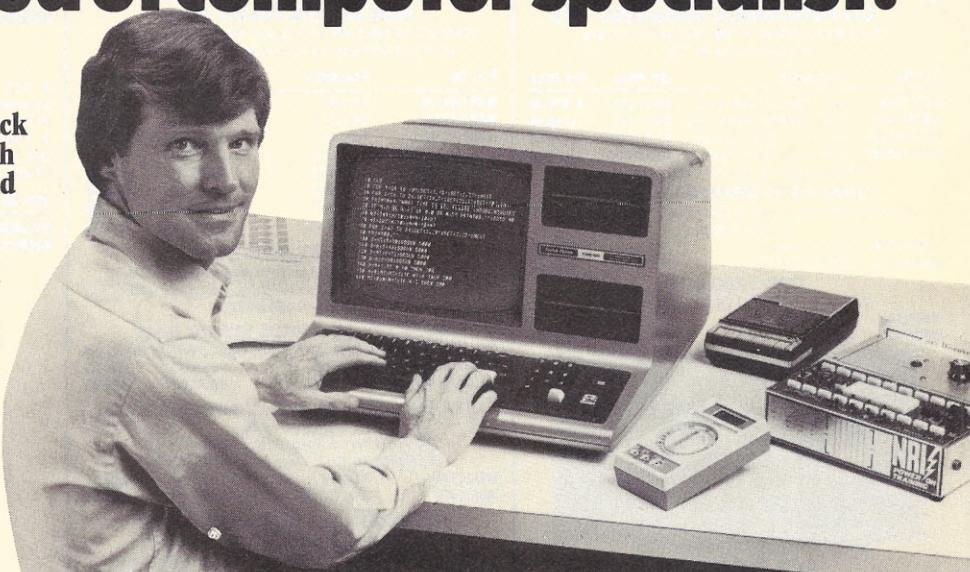
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(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

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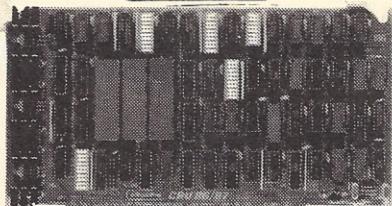
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IHGBT186C	CSC 10MHz 8086 only	\$850.00	\$765.00
IHGBT186A87	A&T with 8087 option	\$1295.00	\$1225.00
IHGBT186C87	CSC with 8087 option*	\$1550.00	\$1456.00
	*8087 requires slower clock speeds		
	DUAL PROCESSOR 8085-8088		
	6 or 8 MHz Provides true 16 Bit Power with a standard 8 bit S-100 bus		
IHGBT1612A	A&T 6MHz	\$425.00	\$399.00
IHGBT1612C	CSC 6/8 MHz	\$525.00	\$498.00
	CPU-Z Z80 CPU		
	2/4 MHz Z80 CPU 24 Bit Addressing		
IHGBT160A	A&T	\$295.00	\$280.00
IHGBT160C	CSC 3-6 MHz	\$395.00	\$375.00

I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K EPROM or RAM provision, 15 levels of interrupt, real time clock, optional math processor

Part No.	Description	List Price	Our Price
IHGBT162A	Assembled & Tested	\$399.00	\$360.00
IHGBT162C	CSC	\$495.00	\$460.00
IHGBT231	Math Chip	\$195.00	
IHGBT232	Math Chip	\$195.00	
IHGBT162AM1	A&T with 8231 Math Chip	\$555.00	
IHGBT162CM1	CSC w/8231 Math Chip	\$655.00	
IHGBT162AM2	A&T w/8232 Math Chip	\$555.00	
IHGBT162CM2	CSC w/8232 Math Chip	\$655.00	

MPX CHANNEL BOARD

I/O Multiplexer, using 8085A-2 CPU on board with 4K RAM	
IHGBT166A4	Assembled & Tested
IHGBT166C4	CSC

With 16K RAM

IHGBT166A16	Assembled & Tested	\$649.00	\$585.00
IHGBT166C16	CSC	\$749.00	\$675.00

INTERFACER 1

Two Serial I/O

IHGBT133A	Assembled & Tested	\$249.00	\$219.00
IHGBT133C	CSC	\$324.00	\$298.00

INTERFACER 2

Three parallel, one serial I/O board

IHGBT150A	Assembled & Tested	\$249.00	\$219.00
IHGBT150C	CSC	\$324.00	\$289.00

INTERFACER 3

Eight channel multi-use serial I/O board

IHGBT1748A	Assembled & Tested	\$699.00	\$629.00
IHGBT1748C	CSC 200 hr. 8 Port	\$849.00	\$750.00
IHGBT1745A	Assembled & Tested	\$599.00	\$559.00
IHGBT1745C	CSC 200hr. 5 port	\$699.00	\$629.00

NEW! INTERFACER 4

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IHGBT187A	Assembled & Tested	\$350.00	\$315.00
IHGBT187C	CSC	\$450.00	\$415.00

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Color Graphics board with Parallel I/O

IHGBT144A	Assembled & Tested	\$399.00	\$349.00
IHGBT144C	CSC	\$449.00	\$399.00
IHGBT2D	Sublogic Universal Graphics Interpreter Software	\$35.00	

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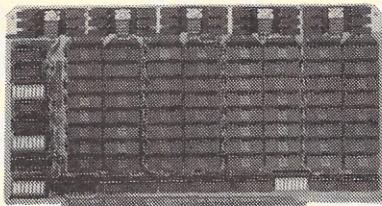
Active termination, 6-12-20 Slot

IHGBT153A	A&T 6 slot, 2 lbs.	\$140.00	\$126.00
IHGBT153C	CSC 6 slot, 2 lbs.	\$190.00	\$175.00
IHGBT154A	A&T 12 slot, 3 lbs.	\$175.00	\$155.00
IHGBT154C	CSC 12 slot, 3 lbs.	\$240.00	\$220.00
IHGBT155A	A&T 20 slot, 4 lbs.	\$265.00	\$235.00
IHGBT155C	CSC 20 slot, 4 lbs.	\$340.00	\$310.00

ACTIVE TERMINATOR

Allows older S-100 motherboards to run faster and quieter
IHGBT106A Assembled & Tested \$59.50

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STATIC MEMORY BOARDS

RAM 20 - 32K STATIC RAM

RAM 20 10 MHz, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

Part No.	Description	List Price	Our Price
IHGBT164AAB	8K A&T	\$210.00	\$190.00
IHGBT164AC8	2K CSC	\$280.00	\$260.00
IHGBT164AA16	16K A&T	\$285.00	\$260.00
IHGBT164AC16	16K CSC	\$355.00	\$325.00
IHGBT164AA24	24K A&T	\$355.00	\$325.00
IHGBT164AC24	24K CSC	\$425.00	\$385.00
IHGBT164AA32	32K A&T	\$425.00	\$385.00
IHGBT164AC32	32K CSC	\$495.00	\$450.00

CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of BYTE

RAM 17 - 64K CMOS STATIC RAM

RAM 17, 10 MHz, 2 Watt, DMA Compatible 24 Bit Addressing

IHGBT175A64	64K A&T	\$599.00	\$550.00
IHGBT175C64	64K CSC	\$750.00	\$699.00

RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit

IHGBT1696	RAM 16 10 MHz, 32K x 16 or 64K x 8
	IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

IHGBT180A	64K A&T	\$650.00	\$599.00
IHGBT180C	64K CSC	\$750.00	\$699.00

NEW! RAM 21 - 128K STATIC RAM

IHGBT190A	RAM 21 12MHz, 128K x 8 or 64K x 16
IHGBT190C	IEEE/696 8 or 16 Bit 1.2 Amps, 24 Bit Addressing

IHGBT190A	128K A&T	\$1695.00	\$1610.00
IHGBT190C	128K CSC	\$1795.00	

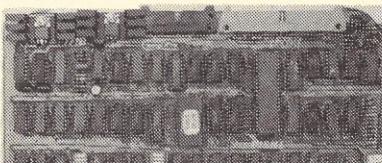
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M-Drive requires a 6MHz CPU 8085/88 dual processor, Disk 1 DMA disk controller and System Suport 1 Multifunction Board

IHGBTMD128K	128K of A&T memory & M-Drive Software	\$1198.00
IHGBTMD128K	128K of CSC memory & M-Drive Software	\$1398.00
IHGBTMD256K	256K of A&T memory & M-Drive Software	\$2395.00
IHGBTMD256K	256K of CSC memory & M-Drive Software	\$2795.00



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DISK 1 FLOPPY CONTROLLER

Fast DMA, Soft Sector, Controls 8" or 5 1/4" Single or Double Density. OUR BEST!

IHGBT171A	A&T	\$495.00	\$450.00
IHGBT171C	CSC	\$595.00	\$555.00
IHGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals	\$175.00	
IHGBTCPM80	CP/M for 8086 with manuals & BIOS 8" S/D disk		
IHGBTCPM80	CP/M for 8088 with manuals & BIOS 8" S/D disk	\$300.00	

IHGBTDA8S	Oasis 8 bit single user 8" S/D disk	\$500.00
IHGBTDA8S	Oasis 8 bit multilayer, 8" S/D disk	\$550.00



S-100 MAINFRAME

110V 60Hz CVT Mainframe uses famous 20 slot COMPUPRO Motherboard 55 lbs.

IHGBTEN20RM	20 Slot Rack Mount	\$895.00	\$825.00
IHGBTEN20DK	20 Slot Desk Top	\$825.00	\$760.00

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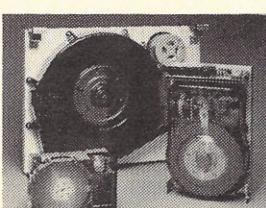


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Part No.	Description	List Price	Our Price
IHMADSDC1	A&T w/Asynch RS232 ports	\$875.00	\$795.00
IHMADPS1	1 Asynch adapter board required for each serial port used	\$30.00	

MORROW DESIGNS



NEW! S-100 5-26 MB HARD DISK SUBSYSTEMS

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Each subsystem includes DMA Hard Disk Controller, Seagate ST506 5 Mb or ST412 10 Mb 5 1/4" Hard Disk, Cabinet, power supply, CP/M 2.2 and Microsoft BASIC.

IHMDSUM1* Software supplied on 8" IBM 3740 disk with blank I/O and INSTALL program

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IHMDSUM1* Software configured for Morrow DJ/DMA controller and Mult I/O as console

IHMDSUM1* Software supplied on 5 1/4" 10 sector North Star disk with blank I/O and INSTALL Program

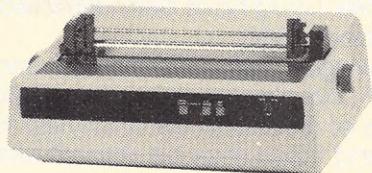
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OPTIONS			
IHSLMF86VFT	Vertical forms tractor	\$200.00	
IHSLMF8648K*	48K RAM buffer	\$400.00	

Call for pricing on sheet feed options

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Part No.	Description	List Price	Our Price
IHSLMN77	Intelligent Printer	\$3295.00	\$2895.00

OPTIONS

IHSLMN77VFT	Vertical Forms Tractor	\$ 230.00
IHSLMN77BDF	Bidirectional Forms Tractor	\$ 400.00
IHSLMN77CSF	NEC Cut Sheet Feeder	\$1595.00
IHSLMN77CSF2	Twin Cut Sheet Feeder	\$2150.00
IHSLMN7748K*	48K RAM Buffer	\$ 400.00

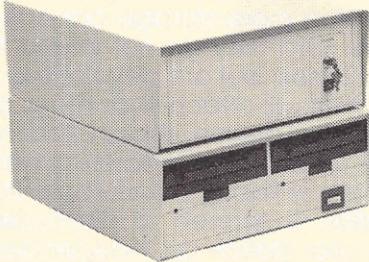
*Must be ordered with the printer

INTERFACE CABLES

IHCPCM572	Centronics IBM/NEC Cable	\$80.00
IHSDB251	RS232C Serial Cable	\$60.00

Call for other cables not listed

Para Dynamics



18 SLOT S-100 MAINFRAME

CVT Power Supply, forced air cooling; security lock
120 or 220V AC at 50 or 60Hz+8V@20A, ±16@3.5
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8 SLOT S-100 MAINFRAME WITH CUTOUTS FOR 2 5 1/4" DISK DRIVES

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IHPDN2508R Rack Mount \$949.00 \$839.00

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Accommodates two 8" floppy drives, of Shugart, Qume, or similar design and dimensions. 110 or 220V AC at 50 or 60Hz CVT power.

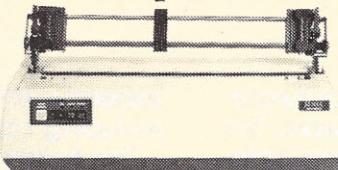
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Free standing cabinet. Will accept 2, 8" Floppy disks and 1, 8" Rigid disk. 18 slot card cage will accept the double height 10" x 10" S-100 cards (Alpha Micro and others) CVT Power Supply.

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- 80 CPL@10 CPI for 82A • 3" to 14" Top of form
- 132 CPL@10 CPI for 83A & (Switch Selectable)
- 84
- 10 Different Character Sets

The above printers come complete with friction and tractor feed. Front panel selection of 10 different form lengths. Front or bottom paper loading for up to 4 part forms and tear bar. All three printers have a parallel interface as standard. The 82A and 83A also include a 1200 baud serial interface as standard.

Part No. Description List Price SALE

IHOKIDAT82AT	80 column printer w/tractor (25 lbs.)	\$539.00
IHOKBFRAPW82	High resolution graphics ROM 60x66	\$ 75.00
IHOKIDAT83AT	132 column printer w/tractor (35 lbs.)	\$750.00
IHKIGRAPH83	High resolution graphics ROM 60x66	\$ 75.00
IHKISER2KBF	9600 Baud 2K serial buffer interface	\$149.00
IHOKIDAT84AP	132 col. printer parallel interface with graphics (35 lbs.)	\$1095.00
IHOKIDAT84AS	132 Col. printer 9600 baud serial 2K interface with graphics (35 lbs.)	\$1250.00

*Sold only with printers

Call for pricing on sheet feed options

55 CPS USING THE NEC 7700

Intelligent Printer \$3295.00 \$2895.00

*Sold only with printers

EPSON

IHEPNMX80	80 col./CPS tractor feed (17 lbs.) with Tractor/Friction feed (20 lbs.)	\$450.00
IHEPNMX80FT	132 col./80CPS (30 lbs.)	\$550.00
IHEPNMX100	Tractor/Friction Feed	\$725.00

IHMBSAPLINTWC* Apple parallel interface with cable

IHMSEI1* Serial interface for EPSON Printers

*Sold only with printers

ADDS
Applied Digital Data Systems Inc.



SALE!
\$525.00

VIEWPOINT - ADDS

Detachable keyboard, RS232 Interface and auxiliary port, 80 x 24 display, tiltable screen.

IHADDVWPR Sh. weight: 30 lbs. \$699.00 \$525.00

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V-100 - VISTA

• Desk or rack mountable • Internal power and data cables

• Drives pull out for easy service and maintenance

IHVVIS100 Disk Drive Cabinet (43 lbs) \$495.00 \$449.00

IHVVIS100 With purchase of two 8" Disk Drives \$399.00

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Dual 8" cabinet with power supply (24 lbs.) \$395.00 \$349.00

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TM-800 Thinline is exactly half the size of conventional 8" floppy disk drives.



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Exactly one-half the height of any other model.
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D.C. only operation - no A.C. required

Industry standard interface.

Three millisecond track-to-track access time (9 lbs.)

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IHTNDTM8482 Double Sided \$575.00 2 or more \$550.00

IHTNDTM8M Manual - not included with drive \$ 10.00

TANDON 5 1/4" DRIVES

IHTNDTM1001 Single Sided, 250KB (5 lbs.) \$249.00* ea.

2 or More \$220.00

IHTNDTM1002 Double Sided, 500KB \$325.00 ea.

2 or More \$299.00

IHTNDTM1003 Single Sided, 500KB \$325.00 ea.

2 or More \$299.00

IHTNDTM1004 Double Sided, 1000KB \$449.00 ea.

2 or More \$420.00

IHTNDTM5M manual, not included with drive \$ 10.00

*As used in the IBM PC.

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Better Than SHUGART!

8", Double-sided, double-density - interchangeable with QUME & Shugart

IHMIMT269463 Sh. Weight 16 lbs. \$550.00

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supplies a complete system including hardware, peripherals and business applications software. The BC-12 is used for accounting, word processing, database management and as an intelligent terminal.

Major new products from Billings include a distributed network system sharing the resources of a hard-surface disk, and an electronic mail system. Though a company still in its infancy, Billings

Though a company still in its infancy, Billings has about 50 dealers and manufactures its own disk subsystems.

has about 50 dealers and sells both in the U.S. and abroad. It manufactures its own disk subsystems, and assembles the computers in its plant in Provo, UT.

With the Billings BC-12DF2M, we continue reporting on the latest set of benchmark tests sponsored by the ACU. The tests were performed by the University of Colorado's Business Research Division under contract for ACU.

Discussed in this article is one of the application problem tests, for accounts receivable, which creates a file on the disk (usually a floppy) and puts 50 records on it, each with 10 fields. Then the file is updated 10 times, along with appropriate calculations for the accounts. To complete the test, a report is displayed on the screen. Since the accounts receivable problem uses both disk and processor operations, it is a fairly well-balanced indication of overall performance.

Results for the Billings system were good-to-fair. In the accounts receivable test, its time of 5:09.2 was mid-range. As tested, the system included the processor, 56K characters of user memory, and two dual-sided, double-density 8-in. floppy disks for a combined total storage of 2M characters. Also included were the display and keyboard, two serial communications ports and a 180 characters-per-second printer.

Software included the Billings Operating System (BOS) and Billings EBasic language. The total price of all components and software was \$12,395, which seems high compared to some of the newer systems recently released by competitors. However, a less

expensive Billings printer could have been selected, reducing cost by about \$800.

The system is packaged with CRT display and keyboard in one unit and disk drives in a separate enclosure. Two pairs of disks can be attached to one BC-12 system, and these may be shared with other BC-12s lacking disk drives.

The CRT displays 24 rows of 80 characters, with reverse video, reduced intensity and 32 graphics characters. The 12-in. display uses green phosphor. The non-detachable keyboard includes a standard typewriter layout, 10-key numeric pad and 16 special function keys.

Billings offers three printer models for use with its systems. The word processing printer, the P-55 is a thimble-type letter-quality printer (NEC Spinwriter) operating at 55 cps.

The P-110 printer is a low cost dot matrix machine with 100 cps speed, bidirectional print head movement, and several modes of operation yielding from 80 to 132 characters per line. The printer can be used with a 7-by-7 matrix for standard printout or a 7 high by 11 wide matrix for enhanced quality.

The printer used in benchmark testing was Billings' P-510, a 180 cps printer with 9-by-7 dot matrix, allowing descenders and underlining characters. The printer includes a control panel for selection of margin and line spacing, page size, and other features. Billings emphasizes the reliability of the print-head (650M characters) as a significant plus.

One aspect of the computer's design was criticized by our benchmark team: lack of a hard disk option for users needing more storage capacity. Billings officials have said they do not intend to offer this for the BC-12 itself, but are developing a central storage unit that will attach to as many as 16 computers. The central device, designated the BC 404, incorporates up to 64M characters of hard disk and 4M characters of floppy disk storage. The resulting configuration is termed a distributed network, with each user station an independent computer system.

Programming attributes

Our benchmark researchers noted with favor the BC-12DF2M's ability to sense when the user has inserted a diskette and closed the drive door. The application program can be written so that the system automatically loads and executes the program, eliminating the need for any operator command to "bootstrap" the disk. Instead, the first menu automatically appears on the screen, directing the user's steps right from the beginning.

The Billings Operating System is a modified version of OASIS, and offers several powerful features. These include password protection, user accounting, a "help" feature, and Exec files that contain sequences of commands to be automatically executed.

The system supports the use of two versions of Basic—plus Cobol, Fortran and Macro Assembler. EBasic was used for the tests; it's a version of Microsoft Basic-80 and had sufficient characteristics. The other version of Basic, BBASIC, is an interpreter-compiler combination with a number of special features, including CASE and DO-WHILE functions that may be nested to any level. The language supports sequential, direct and indexed sequential disk files.

Also offered for programmers' use are a pair of utilities called Print-Assist and Screen-Assist. The "Assist" is an acronym for "Automatic System for Interfacing to Screens and Templates." The programmer can more easily create output to printer and screen using these aids.

Business software is available

Billings supplies several business application programs, including the Bookkeeper series (accounts payable and receivable, payroll and general ledger), inventory management, legal accounting, a database management system, a word processing package, and mailing list and document communications support. Software prices range from \$200 to \$500.

Software Support Group

Especially noteworthy is the Training and Support diskette. It provides on-screen instruction to new users, and is written in a friendly and entertaining style.

Billings also sells an energy management system for its computers, which is individually tailored for the customer and available only from the factory.

Users whose comments were solicited expressed widespread satisfaction with the service received from dealers. "Best part of the Billings is training and dealer personnel," said one customer. Of 16 users contacted, only one expressed displeasure with hardware service; others said the equipment was very reliable. Documentation supplied with the system was denounced by some users, but training was generally praised. The application software received generally favorable reviews, although some users noted that early releases had contained errors (later corrected). □

Research Associate: Vic Schoenberg

Hillel Segal is president of the Association of Computer Users, a nonprofit association with members all over the U.S., Canada and several foreign countries. A complete package of information about membership is available from ACU, Box 9003, Boulder, CO 80301.

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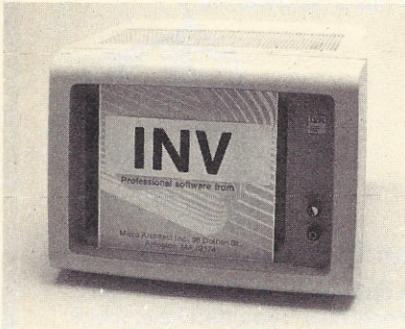
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BUSINESS SOFTWARE

Inventory control for IBM PC

INV-X has a built-in sort/merge package and a report writer. It requires a dual disk



system with 64K bytes of memory, IBM DOS, monochrome display, Basic and a 132-column printer. Micro Architect, Arlington, MA.

CIRCLE INQUIRY NO. 150

Spreadsheet program

The Wedge is compatible with CP/M and MP/M, and has a user-friendly help routine. It can generate text files that may be edited with a word processor or generate a printed report with the results or formulas for calculating the results. The system supports a large row, column matrix, split screen viewing, flexible setup of column widths and numeric fields. Systems Plus, Palo Alto, CA.

CIRCLE INQUIRY NO. 151

Real estate investor package

Quikcalc consists of a template model and is geared to novice computer users.

Any real estate property can be analyzed, from individual residences to large,



income-producing complexes. Simple Soft, Elk Grove, IL.

CIRCLE INQUIRY NO. 152

Visicalc financial models

Finished, generalized financial programs for the Visicalc electronic spreadsheet program, Business Forecasting Model, may be used for forecasting and analyzing businesses, and may be customized. Reports generated by the models are income statement, balance sheet, cash flow, financial ratios, sales and cost of goods sold, salaries and commissions, and assets and depreciation. The 12-key financial ratios are current ratio, quick ratio, debt to assets, debt to equity, times interest earned, profit margin, receivables and payables in days, inventory turns, fixed asset turns, income to assets and income to net worth. Visicorp, San Jose, CA.

CIRCLE INQUIRY NO. 153

Management program for IBM PC

The Context Master of Business Administration program combines electronic

spreadsheet, executive word processing, database, graphics and communications capabilities. Context Management Systems, Torrance, CA.

CIRCLE INQUIRY NO. 154

Integrated programs for Televideo

Micropro applications programs for use on Televideo's small business systems can be used together to perform a series of related processing jobs. The programs run on the TS801, TS802 and TS802H single-user systems, and TS806 and TS816 multi-user computers. Televideo Systems, Sunnyvale, CA.

CIRCLE INQUIRY NO. 155

Accounting system for IBM PC

Count/Up is a General Ledger, Accounts Payable and Accounts Receivable system. It allows the user to write accounting definitions while letting the software create the necessary journals and ledgers. It consists of 24 programs and 5 menus, and permits 53 individual report records and up to 750 account numbers. A user can define up to 20 character fields in a journal transaction, where the length of each field can be up to 24 characters. Squire, Buresh Assoc., Auburn, MA.

CIRCLE INQUIRY NO. 156

Financial modeling for TRS-80

Desktop/Plan-80 offers business and financial managers an alternative to time-shared planning services. A planner, financial analyst or manager can construct financial models, analyze various options and generate finished reports. Once models are defined and initial values entered, calculations are executed and reports produced. Large models can be consolidated from identical submodels, and summary models constructed

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5000 volts of static electricity produces a spark you can see, 2500 volts one you can feel; but it only takes 500 volts to cause a malfunction in some computers, word processing machines, and other sensitive electronic equipment. In other words, just because you don't feel static shocks during the humid summer months, don't assume that your static problems are over.



3M Static Control Floor Mats can create an inexpensive "island of protection" around delicate electronic office equipment, harmlessly draining static charge from operators and other personnel.

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from nonidentical models. Models can be up to 18 ledger-style columns wide, up to 300 lines deep. It can also merge with Visi-calc. Tandy/Radio Shack, Fort Worth, TX.

CIRCLE INQUIRY NO. 157

Directory organizer for TRS-80

Personnel Manager for the TRS-80 model I or model III computers is a personal productivity aid that organizes information about employees, business contacts,

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MORE...	ENTERED (CLEAR) (HIGHLIGHT) / .	

customers, vendors or personal friends. A number of directory formats are available, including user-defined selections. Tandy/Radio Shack, Ft. Worth, TX.

CIRCLE INQUIRY NO. 158

Personal information system

Personal Pearl enables individuals with no technical training or computer experience to describe their requirements visually and in English to the computer. It integrates a database manager, a forms generator, a report generator and a program generator. The simplicity of the system is that it puts all the power of the computer into the hands of the user, giving each person a customized problem-solving ability. It operates under CP/M. Relational Systems, Salem, OR.

CIRCLE INQUIRY NO. 159

Word processing for Fortune systems

For Word, for the Fortune 32:16 includes global formats, mixed text and graphics, true text centering and free-form file



names. Also included in the system is a "HELP" key which, when activated, will identify the problem and, through a series of questions, will aid the nontechnical operator. Its document-related features include the ability to display the status of a document at any given time, show the

amount of time spent in document preparation and calculate the cost of preparation. The system automatically enters all documents into a multiple index that includes author and title. Fortune Systems, San Carlos, CA.

CIRCLE INQUIRY NO. 160

Number processing for Spellbinder

The Spellbinder word processing system has been upgraded to include features like fixed point arithmetic, vertical column editing, and decimal-tabling functions. Running on CP/M or OASIS, the system can process tables of numbers of up to 16 digits, adding down columns and across rows, edit vertical columns, automatically line up numbers along the decimal point, and print tabular material without leaving the proportional spacing mode. Lexisoft, Davis, CA.

CIRCLE INQUIRY NO. 161

Real estate closing system

The Landtech 86 calculates and prepares the documents necessary for conducting real estate closings. It is written in Microsoft Basic version 5 and produces RESPA statements, customized closing statements, disbursement statement, proration statement, deeds, mortgages, notes and other related instruments such as truth-in-lending, seller's affidavit and bill-of-sale. The system is completely menu-driven and prompts the operator for the unprocessed real estate data. Bell Data Systems, West Palm Beach, FL.

CIRCLE INQUIRY NO. 162

Time-management system

Sundial Release 1.1 maintains appointment lists, generates cross-referenced schedules, and analyzes hourly billing for any number of users. It is aimed especially toward the professional office and is capable of scheduling, rescheduling, cancelling, updating, date-range erasing, producing full or partial appointment lists, and producing full or partial cross-reference tables for different schedules. Each record stores a job-code, number of hours billable, and hourly rate, from which billing and efficiency reports are produced. Integron Systems, New York, NY.

CIRCLE INQUIRY NO. 163

Point-of-sale program

The Cash + Plus System allows the use of an Apple computer as a cash register, an inventory controller and a management report. It produces seven different kinds of management reports on a daily and/or month-to-date basis detailing all transactions that occur within the period. It also supports an optional cash drawer on the Apple. Southeast Computer Concepts Corp., Boca Raton, FL.

CIRCLE INQUIRY NO. 164

Financial planning program

Doughflo, compatible with TRS-80 models I or III, is for bookkeeping, tax preparation, cash flow analysis, and financial planning.

AUGUST 1982

Entries can be organized by sorting into date, vendor code, name description, date of transaction, category or check/receipt number. Up to eight income accounts and 33 possible expense categories are automatically provided to group entries. Other possible categories allow sub-categories for running totals of selected debits or credits. Expenses and income, grouped into any of 676 pre-defined two-character vendor codes, are alphabetized. Alphanetics, Forestville, CA.

CIRCLE INQUIRY NO. 165

Financial management system

Personal Finance Master tracks and manages up to seven different asset or liability accounts. Integrating accounts into a Net Worth Statement, the system budgets and tracks expense and cash flow, reconciles bank statements, sorts expenses into tax-deductible categories, automatically records recurring transactions, handles split transactions, provides a simple year-end rollover, produces hires plots of income and expense, handles up to 700 transactions per month, provides up to 100 user-defined budget categories and will print checks and create mailing labels. It requires an Apple II, 48K-byte RAM, a single disk drive (DOS 3.3) and an optional printer. Spectrum Software, Sunnyvale, CA.

CIRCLE INQUIRY NO. 166

Investment monitoring package

Stockchart-I enables the investors to generate daily, weekly, and/or monthly price charts with the stocks' high, low and close prices. It also has the ability to analyze for price-trend reversal signals that could be used to assist the investors in making stock purchases and sales decisions. It will support a maximum of 20 stocks in one master file, unlimited number of master files, and price data storage only limited by disk storage space. System requirements are: Applesoft, one disk drive, DOS 3.3 (16 sectors), minimum of 32K-bytes RAM and optional printer. Micro-Investment Software, Stockton, CA.

CIRCLE INQUIRY NO. 167

Combination package for Vector

Vector Professional Series enables financial data and graphics to be combined into a printed report, then automatically transmitted to one or to hundreds of remote locations. The five-part series (VPS) integrates communications, word processing, financial modeling and graphics with a data manager. Vector Graphics, Thousand Oaks, CA.

CIRCLE INQUIRY NO. 168

BUSINESS SYSTEMS

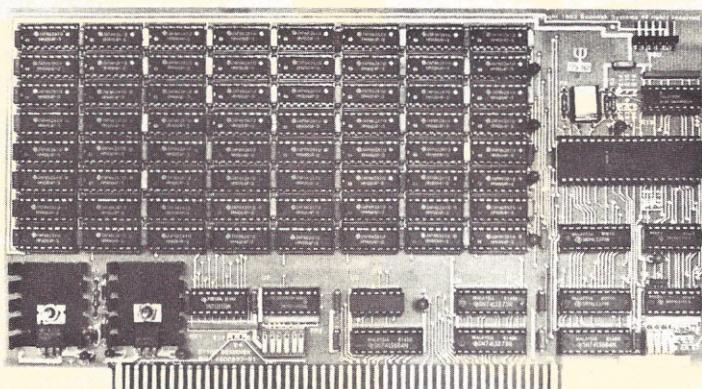
Expandable system

The HP-86 consists of microprocessor and keyboard in one package. The keyboard

features alpha and numeric pads and 14 user-definable special-function keys. Four ports in the back of the computer let the user expand the system's power. The HP 82900 CP/M system, the HP 82950 modem, HP memory modules and additional ROMs all can be plugged into the ports. Dedicated interfaces connect the computer to display monitors and one or two disk drives. The HP 82912 (9-in. diagonal) and HP 82913 (12-in. diagonal) monitors

display text, in an 80-column by 24-line format, and graphics. The HP 9130 flexible-disk drive features 270K-byte capacity and uses double-sided, double-density disks. Compatible software includes the Peachtree accounting products, Dbase II DBMS, tax-planning and project tracking packages, Wordstar, Mailmerge and Spellstar. Hewlett-Packard, Corvallis, OR.

CIRCLE INQUIRY NO. 169



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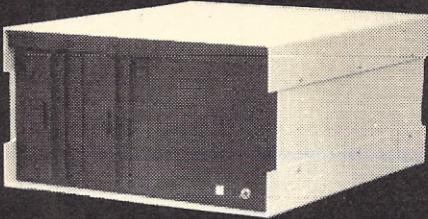
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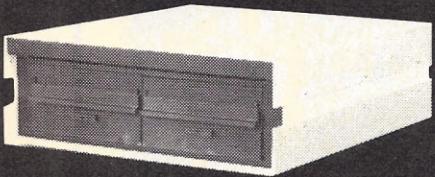
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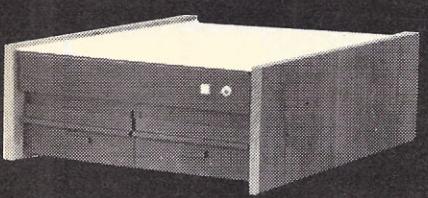
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Powerful 32-bit personal computer

Designed to be a network workstation, the Corvus Concept is also a stand-alone personal computer. Key features are: 32/16 bit Motorola 68000 processor, 256K-byte RAM (expandable to 512K), built-in Omnitel interface, Edward word processing system, Corvus Logical spreadsheet,



and full access to over 2,000 CP/M programs. Languages are ISO Pascal with UCSD extensions and full Fortran-77. Other languages such as Basic and Cobol are available under CP/M. Corvus Systems, San Jose, CA.

CIRCLE INQUIRY NO. 170

Small business system family

The CIES 680 series includes capabilities ranging from single user workstations to large multiuser systems available in configurations from fully packaged systems to unbundled board sets. All systems are based on the M68000 32/16 bit microprocessor technology and employ Intel's Multibus to facilitate peripheral and controller selection. It supports Bell Labs' Unix and Motorola's VERSADOS operating systems and an applications software processor called Pro-IV. CIE Systems, Irvine, CA.

CIRCLE INQUIRY NO. 171

Multi-user family

Altos Series 5 allows three users to share a common database and incorporates advanced micro-Winchester hard disk technology. Compatible with leading

They feature 4 MHz Z80A CPU with 196K bytes of RAM; double-density double-sided flexible disk drive, four serial (RS-232C) I/O ports and a parallel I/O port. Each can be field-upgraded with an additional 5M-byte micro-Winchester disk drive. Other features include direct memory access and parity checking. Altos Computer Systems, San Jose, CA.

CIRCLE INQUIRY NO. 172

Multiuser business micro

Dynabyte 5605 supports up to eight users and 16 printers, and provides up to 19M



bytes of on-line storage integrated with an 8-in. diskette drive (IBM-compatible). The 5605 combines the highest capacity 5½-in. Winchester drive available in capacities of either 6, 12 or 19M bytes, with 8-in. diskette storage of .8 or 1.6M-byte, depending on the single- or double-sided version. It runs under CP/M, MP/M or the OASIS operating system. Languages include Basic, Cobol, Fortran, Pascal and PL/I. Dynabyte, Milpitas, CA.

CIRCLE INQUIRY NO. 173

Portable computer

Courier integrates a 9-in. 80 character by 25 line display CRT, detachable keyboard, 3½-in. Sony microfloppy disks and CP/M compatibility. It features a Z80 CPU, 64K-byte Dynamic RAM, five card slots, and two serial RS-232 Interface ports. It comes standard with Supercalc, Superwriter, Pascal, Basic 80 and Producer. Courier Computer, Anaheim, CA.

CIRCLE INQUIRY NO. 174

CP/M-based desktop computer

The Fox functions as a stand-alone system or can be integrated into Digital Microsystems' HiNet local area network. The



operating systems including CP/M, MP/M and OASIS, as well as hundreds of application packages, the machines are housed in desktop-size cabinets measuring 13.5-by-16-by-6 in. and weighing 25 pounds.



DSC-3/F system brings together in a portable, 30-lb. unit the DSC-3 (Z-80A) processor, a 9-in.-diagonal CRT, two 5½-in. single- or double-density, double-sided floppies (formatted capacity of 307.2K bytes/drive), network interface, four RS-232C serial ports, and two 8-bit bidirectional parallel ports with status lines. It provides 64K bytes of RAM and 1K byte of ROM. Digital Microsystems, Oakland, CA.

CIRCLE INQUIRY NO. 175

Hardware/Software business package
Telesolutions combines TeleVideo Systems' single-user, expandable TS/802 or TS/802H

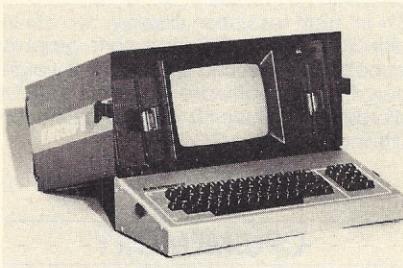


microcomputer with Micropro's Wordstar and Calcstar application software. It provides effective processing solutions for two widespread business needs—word processing and financial planning. TeleVideo Systems, Sunnyvale, CA.

CIRCLE INQUIRY NO. 176

Second-generation portable computer

Kaycomp II has a 9-in. display. The unit is 18-in. wide by 8-in. high by 15½-in. deep. Weight is approximately 25 pounds. It includes two 5½-in. floppy disk drives. Featured are a Z80 central processor,



CP/M, MBasic, Magic Worksheet and a word processor. Interface accommodations include an output for 80 or 120 column printers, and an RS-232C interface. Non-Linear Systems, Del Mar, CA.

CIRCLE INQUIRY NO. 177

Business series

The 500 Series is designed as a stand-alone business computer or as a user station in Billings Computer's Distributed Processing Network. It is available with

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CIRCLE INQUIRY NO. 28

INTERFACE AGE 133

configurations of 5½-in. minifloppies or 8-in. floppies and provides an on-line mass storage capacity of up to 4M bytes. Applications software packages currently available include word processing, letter mass mailings, custom form processing and business accounting programs including inventory management and cost accounting. Billings Corp., Independence, MO.

CIRCLE INQUIRY NO. 178

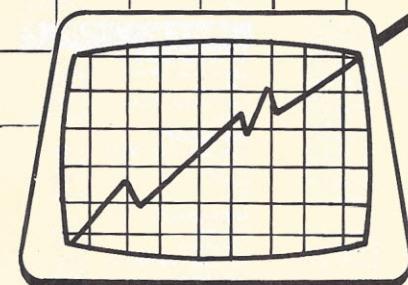
Ergonomic system

The PSI 80Z has a flickerless anti-glare 15-in. screen that may be tilted and rotated and includes high resolution graphics. The keyboard—with a German character layout—is separate from the screen, is graduated and has the auto-repeat and n-key-rollover features. The CPU has a main memory from 128 to 320K bytes. The clock frequency may be either 4 or 6 MHz. Mass storage is located in a

separate housing that may either be used as a desk top or integrated into a desk, depending on the version; it includes two floppy disk drives with a total of 1.2M



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bytes capacity or a 5M bytes Winchester with a 600K bytes floppy for backup. Kontron Mikrocomputer GMBH, West Germany.

CIRCLE INQUIRY NO. 179

Computer system for automotive aftermarket

The Partner is an inexpensive compact system for aftermarket jobbers. It can store up to 18,000 parts numbers for jobber inventory purposes. It utilizes Data General's MPT/100, and provides inventory control, point-of-sale invoicing, accounts receivable, ordering and profit analysis. Inquiries about parts are answered, with up-to-the-minute balances on prices, quantities on order and current, aged and total balances. Other features include automatic recalculation of reorder points, and automatic discounting during invoice preparation. CDA, Clifton, NJ.

CIRCLE INQUIRY NO. 180

Portable computer

Attache is an integrated system with Z80A and DMA processor, 64K bytes of RAM, 5½-in. high resolution display, two 5¼-in. disk drives, two RS-232 serial ports, graphics capability and sound synthesizer. It weighs only 19.6 lbs. Software included is CP/M, Wordstar-Plus, Basic-80, Valet and Charton. Otron, Boulder, CO.

CIRCLE INQUIRY NO. 181

CPU/MEMORY

Access to CP/M for Apple II

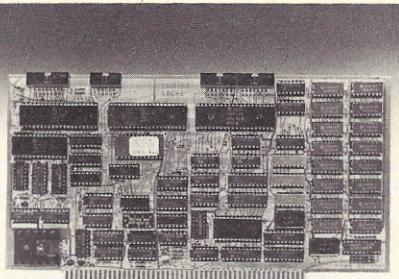
SoftCard Premium System is a package of stand-alone boards that provide an additional 16K bytes of buffered memory, 80 columns of display and automatic selection of graphics as well as compatibility with CP/M software. Microsoft Corp., Bellevue, WA.

CIRCLE INQUIRY NO. 182

Interface board

SBC-I contains a CPU, two serial ports, two parallel ports, and 128K bytes of user RAM on an IEEE S-100 board. Capable of

operating as a slave on the S-100 bus in a multi-processing system, the SBC-I can



also be implemented as a stand-alone single board computer in a network environment. It has memory management hardware that allows the onboard Z80A (optionally Z80B) to directly address 128K bytes in 4K-byte segments. In addition to user RAM, there is provision for up to 8K bytes of on-board EPROM to be used for initialization routines. The 2716/32/64 device can be disabled by software after initialization. The S-100 bus is via a 1K byte or 2K bytes FIFO. Teletek, Sacramento, CA.

CIRCLE INQUIRY NO. 185

64K-byte memory for ZX81

Memopak fits onto the back of the Sinclair. The ZX81 printer can be attached on



the back again, and the memory pack requires no extra power supply. Memotech Corp., Denver, CO.

CIRCLE INQUIRY NO. 183

Double density for Osborne

This upgrade kit doubles the capacity from 92K bytes to 184K bytes of storage, also doubling the transfer rate of the computer. It automatically recognizes different densities when diskettes are changed. Osborne Computer, Hayward, CA.

CIRCLE INQUIRY NO. 186

Nonvolatile RAM memory board

NOVRAM-1 is for STD bus industrial applications, providing up to 4K bytes of non-volatile RAM. A single 5V supply is the only power source necessary. High speed storage operation makes this board well-suited for safekeeping of data during power failures or brown-outs. Operating system boot information can be stored

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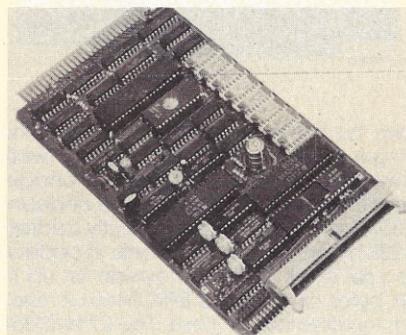
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and changed at any time and will always be ready at power-up. Addressing is selectable on any 4K boundary by changing a single hex switch on the board. Acquis Data, Irvine, CA.

CIRCLE INQUIRY NO. 187

Ultra-small 64K-byte board

Little Big Board features a Z80A CPU, two RS-232C I/O ports, 5-in. or 8-in. disk interface, real time clock, calendar and STD



bus configuration and measures 115 by 200mm. It is capable of operating with either CP/M 2.2 or MP/M II. Pulsar Electronics, Victoria, Australia.

CIRCLE INQUIRY NO. 184

DATA COMMUNICATIONS

Networking system

InfiNET Series supports from one to 32 users, performing simultaneous tasks, in a fully CP/M-compatible multiprocessor environment. Each user has a dedicated computer and an interprocessor link enables processors to talk directly to each other. Minimum configuration consists of the File Processor (Z80A, 64K bytes RAM with parity checking and floppy disk controller), 10M bytes Winchester disk storage, 8-in. floppy disk drive, two RS-232C ports, one parallel port and the n/STAR Network Operating System. This can be operated as a stand-alone single user system running under CP/M version 2.2. For multiple users, InfiNET-I runs under the n/Star Network Operating System, with one Application Processor per user, up to eight users. Molecular Computer, Cupertino, CA.

CIRCLE INQUIRY NO. 188

Communications program for CP/M

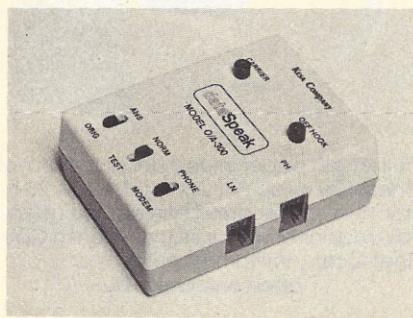
Ascom is for those who need to interact with remote timesharing services or local computer to transfer data files and programs. It can be used on computers such as the TRS-80 model II, Ohio Scientific, North Star, Cromemco and others. The program includes features to receive and transmit data files, various communication protocols, conversational mode, batch mode for automatic processing with command files, and system level commands for displaying directories and typing files

to the screen or printer. Dynamic Microprocessor Assoc., New York, NY.

CIRCLE INQUIRY NO. 193

300 baud modem

DataSpeak O/A-300 features originate and (manual) answer modes, RS-232 serial interface, and test mode, measures 3.5-in. by 1.5-in. A useful "off hook" light alerts the user the phone line is in use.



Power is supplied by a wall mount power converter. Connection to phone line and the user's telephone is by standard modular RJ-11C jacks. Kesa Company, Sunnyvale, CA.

CIRCLE INQUIRY NO. 189

Laboratory integrator
The Applegator II is designed for commercial testing laboratories. It features specific applications software for chromatography, spectroscopy, colorimetry, and



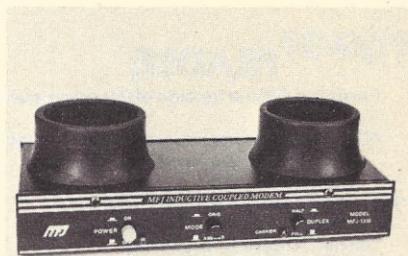
flow measurement, as well as general-purpose software for pulse integration and data acquisition. Dynamic Solutions Corp., Pasadena, CA.

CIRCLE INQUIRY NO. 190

Originate/answer modem

MFJ-1230 is used like an acoustic-coupled modem, but it uses an inductive coupling technique for receiving. This Bell-103 compatible modem operates 0 to 300 baud,

features half and full duplex operation, and is crystal-controlled. It provides TTL



and CMOS inputs/outputs as well as RS-232 compatibility. MFJ Enterprises, Starkville, MS.

CIRCLE INQUIRY NO. 191

Communications for CP/M

Crosstalk Version 2.0 data communications program for CP/M, CP/M-86, or IBM DOS based microcomputer systems allows any CP/M-based microcomputer system to access almost any ASCII dial-up computer system, capture and store received data, send pre-edited files to a remote computer system, and exchange files

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Aspen Software also has its own full featured word processor called Writer's Companion for all these systems. One of the best implementations of Ratfor (Rational Fortran) is available, too, along with an automatic Ratfor pretty printer. Please call or write for more details about these products.

Grammatik and Proofreader are compatible with all CP/M, MS-DOS (incl. IBM PC), and TRS-80 word processors. Current CP/M formats: standard 8", Northstar, Omikron, Osborne, Apple. Please call or write for details of minimum system sizes and availability of additional disk and operating system formats. Shipping costs included. Please specify your system configuration when ordering. Dealer inquiries invited.

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with other systems. It can automatically dial up a system, establish access through



passwords, and loan in data at full modem speed for off-line editing later. Microstuf, Inc., Marietta, GA.

CIRCLE INQUIRY NO. 192

Mainframe communications for Apple

Datalink provides an instant access telephone directory—one keystroke sets the communications environment, dials, and logs the user into the host computer system. It can access timesharing systems, databases and bulletin board systems, transmit electronic mail, transfer Pascal files, or access university computer systems. It is compatible with the Hayes Micromodem II, the Apple Communications Card, the California Computer Systems 7710A Asynchronous Serial Interface Card, the SSM A10 Card and the Novation Apple-Cat II. Link Systems, Santa Monica, CA.

CIRCLE INQUIRY NO. 194

MISCELLANEOUS

Carrying case for HP-41

The case holds the HP-41, spare batteries, card reader, card folder, battery charger, printer and spare paper or tape drive



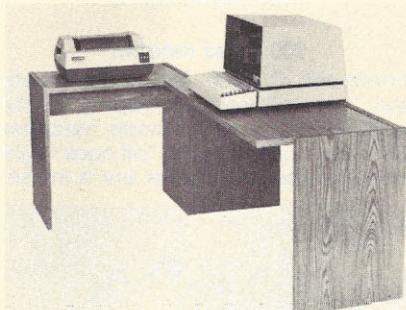
and spare tapes, up to eight port caps or modules and a wand. All components are operable without removal from the case. Marketing Systems Int'l., Northridge, CA.

CIRCLE INQUIRY NO. 195

Workstations

Manufactured from 1-in. all-wood solid core particle-board surfaced with melamine veneer, in either oak or walnut

finish, the 50-in. and 30-in. Uni-Level designs are 26½-in. high and feature a



full length paper infeed slot at the rear of the 24-in. deep flat work surface. A 29-in. by 18-in. printer stand can also be utilized as additional work surface. Atlantic Cabinet Corp., Williamsport, MD.

CIRCLE INQUIRY NO. 196

Character repetition feature

Auto Repeat for revision 7 and later Apple II computers as well as all others have the piggyback encoder board on the keyboard. It allows repeat by holding the character's key down without pressing the REPT key. It features an adjustable delay to start repeating and provision for remote on/off switch. Master Manufacturing, La Mirada, CA.

CIRCLE INQUIRY NO. 197

Apple II replacement cables

Disk II replacement cables for the Apple II are available in one foot increments up to 20 feet long and are made from flexible unshielded ribbon cable. Master Manufacturing, La Mirada, CA.

CIRCLE INQUIRY NO. 198

Computer transfer switch

MFJ-1240 has three standard RS-232 25 pin D connector sockets—one input and two outputs. You can use one computer with a printer and a modem, or two printers. You can share one printer with two computers and not have to move

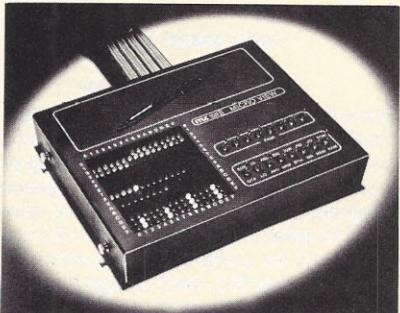


cables. Switched lines are TD, RD, RTS, CTS, DSR, CAR, unassigned, XMIT CL, REC CL, and DTR. Other lines can be substituted by changing the connections in the plug or cable. There are seven LEDs for monitoring operation. MFJ Enterprises, Mississippi State, MS.

CIRCLE INQUIRY NO. 199

Microprocessor debugging too

Micro View monitors activity on a screen of 256 LEDs. It shows real-time information through changing patterns. Various modes permit selection of address or data; read and/or write; input/output or memory; detailed or overview modes; and one, several, or all pages of memory. The display shows program flow, memory references, port activity, and hardware-



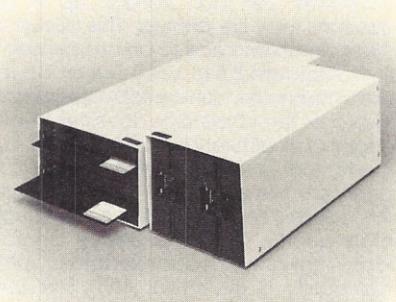
software interaction. The program stack is seen as a moving bar graph. Unstable electronics and intermittent activity are also seen directly. It can be used with the 1802, 6502, 6512, 6800, 6802, 6808, 6809, 8035, 8039, 8080, 8085, F8, Z80, Apple, STD-BUS and the TRS-80. There is also a user-definable pack. Micro Logic Corp., Hackensack, NJ.

CIRCLE INQUIRY NO. 200

PERIPHERALS

Disk drive subsystems

Matchless 5½-in. system will handle one or two single or double-sided drives. Another will accommodate slimline 8-in.



drives. Both are jumper-selectable for 110V/60Hz or 220V/50Hz operation. Matchless Systems, Gardena, CA.

CIRCLE INQUIRY NO. 201

5½-in. Winchester subsystem

Targa disk drives are compatible with the Xerox 820, the IBM PC, Heath/Zenith, Intertec SuperBrain, Apple, TRS-80 and S-100 systems. They are offered in 5M byte, 10M byte and 20M byte models, with the 5M byte system upgradeable to 10M bytes, and the 10M-byte upgradeable to

20M byte with the addition of optional disk drives. CMC Int'l., Bellevue, WA.

CIRCLE INQUIRY NO. 204

Interface for Televideo and Wang

The ACS 100 module works with the Wang 2200 series of computers, the VP, SVP, LVP, and MVP. It allows the Televideo 950



and 925 terminals to substantially emulate the Wang 2236 DE work station. Automated Control Systems, Bellevue, WA.

CIRCLE INQUIRY NO. 205

Commodore enhancements

The SoftBox, HardBox, and Petspeed compiler bring the CP/M operating system, Winchester hard disk mass storage, multi-

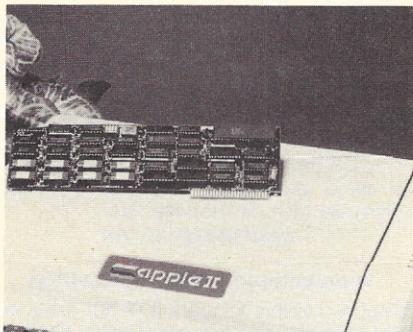


user capability, and high-speed Basic compiling to all Pet and CBM microcomputers. Small Systems Engineering, Brisbane, CA.

CIRCLE INQUIRY NO. 202

Coprocessor module

The 88Card contains an auxiliary central processing unit incorporating an Intel 8088 16-bit microprocessor plus 64K bytes



of RAM and control functions. It plugs into a vacant slot in the Apple, turning it into



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CIRCLE INQUIRY NO. 16

a 16-bit personal computer with 128K bytes of memory. It allows immediate selection between conventional Apple operation and IBM Personal Computer programs running standard operating system software. Coprocessors Inc., San Jose, CA.

CIRCLE INQUIRY NO. 203

POWER SUPPLIES

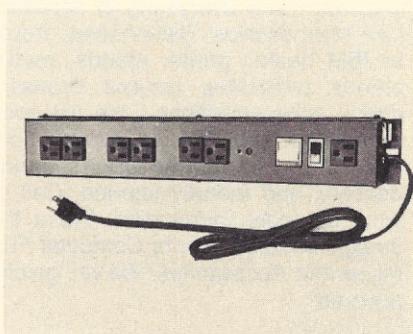
Power source for Osborne computer

Portable Power weighs 4.6 lbs., and includes an AC/DC power assembly, a high-performance sealed battery in a leather carrying case, an AC charger, and a battery-to-computer cable. Should power be interrupted, it automatically switches from AC to DC, functioning as an uninterruptible power source. Up to one hour of battery support is provided. When the energy level of the battery is near depletion, a warning buzzer sounds. It can be recharged in 16 hours. The battery-to-computer cable features an automobile cigarette lighter-style plug, which allows the user to operate from a 12-volt automobile battery. Osborne Computer, Hayward, CA.

CIRCLE INQUIRY NO. 204

Multi-outlet AC power center

MFJ-1108 features a protective relay—momentary power line off-on transients cause this to latch out power before damage to disks and equipment can occur. Individual filters isolate each line of each pair of sockets from power line noise and hash, and from the other pairs of sockets. Interaction between printers, processors, floppies and other equipment is eliminated. Varistors between each line and ground and between lines suppress voltage spikes that can cause memory



loss, erratic operation and equipment damage. Voltage spikes are instantaneously clamped to a level that is safe for equipment and a constant flow of electrical power is maintained. MFJ Enterprises, Mississippi State, MS

CIRCLE INQUIRY NO. 207

Uninterruptible power supply

Model 1409 is connected to a battery and plugged into a commercial AC power outlet. It consists of a DC-to-AC

inverter, battery charger and appropriate sensing, and line-to-inverter transfer circuitry. During interruptions of the commercial AC power, the user's load is



powered by the inverter. When commercial power is restored, the load is automatically transferred back to commercial power and the battery charger automatically recharges the user-provided back-up battery. It is designed to be compatible with almost any load, including waveshape/EMI-sensitive equipment. Wilmore Electronics, Hillsborough, NC.

CIRCLE INQUIRY NO. 208

Portable power supply and regulator

U.P.S.A.R. is a solid state device that generates 240 volts 50 hz sine wave independent of the main electricity supply, thus giving a continuous spike free, solid foundation to any computer system. It can be used with mains input voltages from zero to 270 volts a.c. at frequencies from 40 hz to 70 hz, and output voltages from 110 volts to 240 volts. The device incorporates internal batteries, which provide the computer system with the necessary electricity in the event of either momentary power fluctuations or a full mains failure. Compec Systems Ltd., Welton, Brough, N. Humberside, England.

CIRCLE INQUIRY NO. 209

PRINTERS

Letter quality printers

The Olympia ESW 102 and ESW 103 are printers with similar capabilities. Standard lettering with varying typestyles, proportional spacing, four pitches, bi-directional printing and print wheel cassette insertion for operator convenience are all features of the ESW 102. Print speed is 17.5 cps. Tractor and sheet feed options are available. The ESW 103 incorporates all of the features and options of the ESW 102 and may be used as an electronic typewriter or as a printer by depressing a key. Olympia USA, Somerville, NJ.

CIRCLE INQUIRY NO. 210

Typewriter-to-printer conversion

Electric Typing Fingers (ETF-80) turns an IBM Selectric or equivalent typewriter into a printer. Interface cables are available for many different microcomputers in-

cluding TRS-80, Personal Micro Computers PMC-80, PMC-81, and EPS-80, and Apple II. An adapter for the IBM Personal Computer is also available. The unit is placed on top of the typewriter keyboard and plugged into the parallel printer port. No modification of the typewriter is necessary and no additional software is required. All memory space is available making the unit compatible with any processing program. Personal Micro Computers, Mt. View, CA.

CIRCLE INQUIRY NO. 211

Letter-quality printer

Spinwriter Model 3550 can be attached to the IBM PC parallel printer port, becoming functional for both data processing and word processing applications. It operates at speeds up to 35 cps. The unit allows users to select from over 50 print thimbles designed for word and text processing, business, scientific, and foreign language applications to complement the IBM PC character set. The thimbles come in constant pitch and proportional spaced fonts, and some can print as many as 203 columns on a 13.6-in. print line. It can accommodate up to 16-in. wide paper. Automatic proportional spacing, bold and shadow printing, automatic underscore and bi-directional printing, centering, justification, superscripting and subscripting are automated. NEC Information Systems, Lexington, MA.

CIRCLE INQUIRY NO. 212

Wide carriage printer

Model MP150 is a wide carriage matrix printer designed specifically for mini and micro business systems. The printhead forms characters bidirectionally in a logic-seeking mode. It can print a full 136 character line at 10 characters per inch or, by selecting either the 12 or 16.7 character per inch density, up to 226 columns may be printed. This allows full 136 column printouts to be condensed to fit on standard 8.5-in. wide paper. Double wide characters can be software-selected in any of the character densities to give a total of six different CPI densities. A 7-by-9 matrix font is used for high speed data printing while an 11-by-9 serif style matrix font is used for applications requiring a high quality correspondence printout. High resolution dot addressable graphics capability is included. MPI, Salt Lake City, UT.

CIRCLE INQUIRY NO. 213

Printer application package

The Apple AP Pak for the Apple II contains an Auto Plot printer control card, interface cable, and software programs. It permits an unlimited number of character fonts, large headlines, intermixing type fonts on a line, graphic dumps of hi-res files, automatically generating and individualized computer letters. MPI, Salt Lake City, UT.

CIRCLE INQUIRY NO. 214

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BOOKS

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DATA AND INFORMATION PROCESSING
DATA BASE, WORKSTATION AND COMPUTER SYSTEMS
EDITED BY RICHARD J. THIERAUF AND GEORGE W. REYNOLDS
PUBLISHED 1982 BY ADDISON-WESLEY PUBLISHING COMPANY INC.

Trade Secrets

by James Pooley

Osborne/McGraw-Hill, Berkeley, CA

Reviewed by Dan W. Post

Written by a Silicon Valley attorney, this book addresses itself to contemporary business professionals attuned to the correlation between ideas and money.

The volatile high-tech industries are particularly vulnerable to piracy of important trade secrets and intellectual property. Rumors abound of conspicuous efforts to hire rivals' employees, infiltrate competitors' operations and unethically tap data banks. Continual product refinement and innovation, increased employee mobility and decreased loyalty have spawned an age of complex litigation intended to thwart the proliferation of the "spin-off, start-up" competitor.

Although computer-related crime is attracting considerable media attention, no business has ever been immune to spies and unauthorized transfer of material. Espionage is not limited to conglomerates; it can be most painful for smaller companies. Proprietary information and assets range from customer lists and advertising plans to product ingredients.

Pooley lists techniques for guarding against loss of secrets, careers and money. He advises employees on contractual obligations and employers on security measures. By counseling both sides, he works to sidestep complex legal confrontation. Nonetheless, a typical lawsuit is presented to educate the reader in the event that precautionary measures fail and a court battle is ignited. This topic will become increasingly important as the transition to an information-oriented society matures.
250 pages \$19.95

Increasing Productivity in the Microcomputer Age

by Donald S. Fitch

Addison-Wesley, Reading, MA

The title of this work is deceptive. Many words are spent acknowledging the advent of an industrial revolution based on the electronics industry, yet few suggestions for elevating performance are supported by actual microcomputer application. Only an obscure portion of the book seriously considers the computer as a tool for achieving a renewed prosperity.

No keyboards or modems here—just old-fashioned behavior-modification. The bulk of the material deals with human resources and cultivation of emotional and physical health. Personal improvement through self-discipline and better business practices via policy reform are central topics. This is an enthusiastic crusade to restore America's economic vigor by nurturing the individual strengths of its citizens.

A self-help manual that would be valid in any era, it is a composite of established life-management principles. Though somewhat eclectic, the study's depth represents substantial research. Quotes are used liberally to help relate observations to more familiar thoughts.

Unfortunately, inconsistent graphics—ranging from weak line illustrations and hand lettering to dynamic charts—dilute the text's effectiveness. For all of its short-

comings, this collection of progressive thoughts cannot be discounted as a useful supplement to the endless struggle for optimum productivity.

—DWP

320 pages \$16.95

Computers and Data Processing

by Harriet Capron and Brian Williams

The Benjamin/Cummings Company, Menlo Park, CA

In a field subject to such rapid and significant evolution as the computer industry, many publishers seek to capitalize on trends with shallow words beneath the veneer of a marketable title. Compiled rapidly—amidst minimal quality control—these releases fade into obscurity after initial sales activity has subsided. Contrastingly, this book is assured a different fate.

On one level, this text is a supplement to academic courses, but it is also of potential interest to anyone pursuing an awareness of the new technology. A superior effort, it boasts commendable depth and accessible technical treatment. It is a high quality, up-to-date effort at spreading computer literacy.

Subjects covered have been elaborated on in part in some other works, but have not been wrapped in a single package—at least not adequately. Structured programming, data communications and teleprocessing, personal computers, word processing, operating systems, robotics, databases, management information systems, security and privacy, and computer and data processing careers are discussed in detail. Extensive examples and applications dealing with business, science, engineering, arts, farming and law illuminate areas for human interaction. A complete mini-course in Basic is even presented in the appendix. A combination glossary/index provides easy references to a well-designed format.

—DWP

515 pages \$21.95

Effective Information Systems Management

by Robert J. Thierauf and George W. Reynolds

Charles E. Merrill Publishing Co., Columbus, OH

Reviewed by Richard Krajewski

Basic managerial concepts are seldom abstract. By nature they are straightforward. Consequently, their descriptions should also be shared in a direct manner.

Unfortunately, rhetorical phrases and a pretentious style saturate this text. For example, readers are burdened with deciphering the "Principle of Setting High Performance Standards." Theoretically, this is sound, time-proven advice, but simply saying "to set high standards" would have sufficed.

There are design problems, too. Notes and asides are set in a typestyle so fragile that they are difficult to see. Key terms are not effectively highlighted. Reasonable margin limits are ignored—as a result, random excursions to page edges are made by various tables, figures and charts. Distracting boxes are placed around summaries, introductions and other copy in an effort to separate them from each other in this overcrowded format.

Poorer than average design and hazy writing handicap this effort. Still, an information systems manager might derive some insights if he is willing to sift them out.

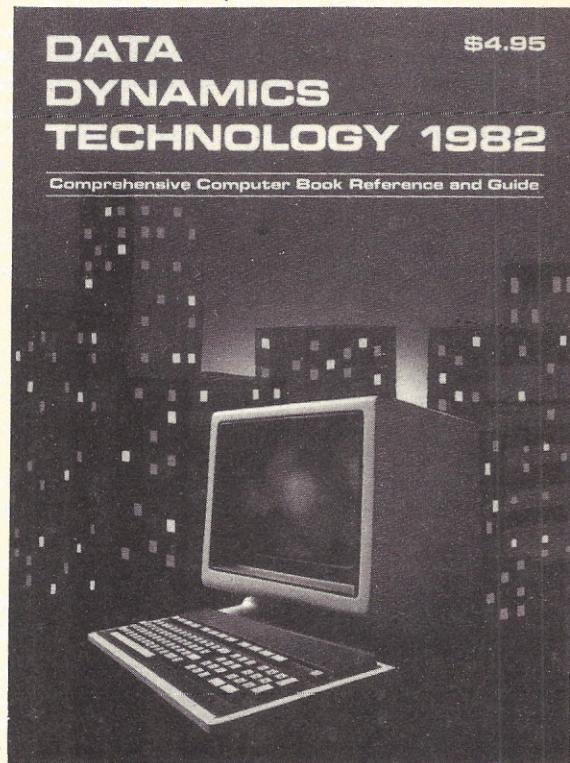
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Word Processing

Continued from page 22

It takes time for the drive to find this mode; if you type in the correction too rapidly, the letters pile up. To continue to the next word, you must hit ^L, taking you out of edit mode back into the spelling check mode, again taking time. There is also the possibility of misspelling the word when you retype it.

The B choice lets you bypass the word and perhaps come back to it later. Should you ignore the word (if it is correctly spelled but not in the dictionary), the ^@ flag will be removed. You can also ask that a correct word be added to a dictionary, D and S, choices. You cannot correct and add a word to a dictionary on the same pass. Any word you ask Spellstar to ignore or add will be remembered and handled in the same way automatically next time it appears. This memory capacity feature will be valid for about 20 words (128 bytes) in any one file. It would be more helpful if misspelled words were remembered and added automatically.

Spellstar goes through a file rapidly. The initial reading, of the same manuscript used in the previous programs indicated a word count of 654 words with 47 errors in 58 seconds. This does include marking all mismatched words—but no other decisions about what to do with the word nor any correcting procedures.

Spellstar's dictionary maintenance is a major feature—not a supplement to the spelling check. It maintains four

kinds of word files for its dictionaries: 1) With the document file, all the words in any one document can become a dictionary; Spellstar sorts them and ignores duplicates. 2) A list of words enables you to assemble for a special dictionary. 3) An .ADD file is composed of words you asked Spellstar to pick up from those in a document you put through the spelling check. 4) Finally, an on-disk dictionary may be purchased that includes correctly spelled words from a particular subject area. All dictionaries can be edited with Wordstar commands.

Spellstar is readily available from outlets that sell Wordstar. A demonstration from your dealer will help you to become familiar with the way spelling procedures occur in the document. It takes time to adapt to the multiple key functions required for some of the operations.

These three programs offer a potpourri of beneficial features. When possible, try to experience and compare any two programs, feature by feature. Reading about how they work in a manual or an advertisement will never prepare you for the advantages and disadvantages of a program, as well as a hands-on demonstration or a tutorial. □

Contributing editor Dona Z. Meilach is the author of over 65 books and hundreds of magazine articles on a variety of subjects. She is hooked on computers for the creative process. She is currently writing a novel, a book about computers, and is conducting author workshops and tutorials on word processing and spelling systems.

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Education

Continued from page 26

composition is keyed in and the two are linked. If one such package were not enough, the topic could be broken down into as many of these tutorials as needed for full coverage.

In addition to this potential, several other useful features aid in creating effective learning experiences.

TLS provides both a Master and a Player disk for booting. The Master disk gives full access to all files, but the Player is intended to be used by learners, allows access only to tests and associated information, never to student records or—in the Test Mode—to answers.

The program automatically randomizes each test package. Every set of questions or matching phrases is randomly re-shuffled for each presentation. TLS uses the original numbers internally to keep track of questions, answers, hints, linked composition material and the student's responses. Within each unit, the learner will always see the material in a new sequence.

In the Instruction Mode, the review of missed questions is automatic at the end of each tutorial. In the Test Mode, the review is optional. TLS displays each missed question, with the wrong answer and the right answer, one at a time in response to keystrokes. In the Instruction Mode, TLS gives the learner two or three chances to key in the correct answer. If not, it flashes an appropriate response, displays the correct answer, and prompts the learner with the cursor on the next line. Keying in the answer induces immediate visual feedback for both errors and correct responses. In certain circumstances, the program will not accept incorrect input and will ignore all key-presses except the one that matches the answer already displayed. During subsequent review, TLS prompts the learner to re-key the correct answer, letter for letter, as an aid to retention.

TLS automatically manages each learner's records, as well as the track record of each test. After a learner completes a test, the instructor is needed to insert the Records disk so the learner's performance can be recorded. Then the program re-cycles and control is returned to the learner. Later, the instructor can use the Master disk to access the Records disk and analyze patterns of response broken down by student, or by test.

Despite all its good points, TLS is missing a few features that would make it better.

It should hold the learner's place in the tutorial material. This would enable the learner to interrupt a lesson and pick it up again without having to go over old material.

The program would also benefit from a provision for judging when an answer to a fill-in question is close enough. Answers with a single mis-matched character should be good enough to rate as correct—at least in the Instruction Mode. The instructor must examine the results of all tests manually in order to be fair to the learners. This task eliminates most of the savings of time and energy the computer is supposed to generate.

Also, the program should have enough word processing capability to allow for compositions in upper and lower case. The all-caps format is difficult to read and gives an unprofessional appearance to the displays.

Like most Micro Lab documentation, there is plenty of material, in a multi-tabbed loose-leaf format. There are also some eye-catching errors and a general disregard for appearance and style. For example, I found phrases

like "a quick and easily reference summary," typos like "The Learing System," and self-conscious comments like "clever, huh" and "couldn't resist." In addition, the documentation is typed by a word processor with a very bad justification scheme. The single-spaced lines combined with uneven spacing between words makes the material hard on the eyes.

Despite the flaws in appearance and style, the content is good. The manual walks you through every menu, every option and virtually every keypress required to operate the program. There are also some examples of tests and printouts to give you ideas of how TLS can be used. One drawback of this walk-through style is the difficulty of going back to find something you remember reading. The documentation would certainly benefit from an index to program functions and a command key summary.

Although it's no substitute for a live instructor, the program can help unload much of the burden of instruction onto the capable shoulders of the Apple II. □

Robert Moskowitz is a full-time management consultant and business writer. He has authored management programs and produced industrial training films. He wrote How To Organize Your Work and Your Life (Doubleday) and has contributed to numerous publications. He is currently Editor-in-Chief of Executive Productivity and Office Technology Management and recently developed the computerized Personal Productivity Audit system.

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Entertainment

Continued from page 30

orderly assignment of qualities to positions and ensuring that each assignment does not conflict with previous examples, the majority of permutations are excluded. The 24,883,200,000 are reduced to 2133, and the decades of computation are reduced to 14 minutes on a TRS-80 with extended Basic.

The program continually notes progress by displaying the names of what has been tentatively assigned, the

This program... shows the stupidity of a computer by the amount of time spent looking for a solution with the Englishman in the second house.

numeric assignment vector and the number of permutations that have been tried.

Often, data statements are long sequences of short fields. These can be made more effective to work with by combining the fields into strings and dissecting the strings under program control. Lines 260 to 310 do this loading of data into tables. The information in the data statements is, for each quantity:

- a) A five-digit name of the quantity (QS)
- b) A two-digit rule number (not used)
- c) A one-digit ruletype (Q1)
- d) A one-digit constant or the first subscript of a quality to be used in the rule test (Q2)
- e) A one-digit second subscript of the quality (Q3)

Q1, the ruletype, indicates that the proposed position is to be compared with:

- 1: Nothing
- 2: The position Q2 (1 to 5, left-to-right)
- 3: The position of quality (Q2,Q3)
- 4: Left or right (plus or minus 1) of the position of quality
- 5: Right of the position of quality (Q2,Q3)

When a potential solution is found, the program stops. Hitting the ENTER key will continue the search.

This program is almost a minimum of logic to solve the problem. It shows how effective a computer can be by rapidly grinding away without complaint. It also shows the stupidity of a computer by the amount of time spent looking for a solution with the Englishman in the second house. This is clearly impossible, since the Englishman lives in a red house, and the blue house must be the second house by rules 9 and 14.

One more solution—the most elegant—will be presented in next month's column. □

Program listing

```
100 '--ZEBRA
110 ' DAVID A CROMLEY, 1982
120 ' NOT TO BE SOLD: ANY COPY OR MODIFICATION
130 ' OF THIS PROGRAM MUST CONTAIN THIS NOTICE
140 DATA "ENGL SPAIN UKRAI NORWG JAPAN"
150 DATA " 100 100 100 09201 100"
160 DATA "RED GREEN IVORY YELLO BLUE "
170 DATA "01301 03508 100 100 14484"
180 DATA "OGOLD KOLD CHEST LSMFT PARLI"
190 DATA " 100 07309 100 100 13305"
200 DATA "COFFE TEA MILK JUICE WATER"
210 DATA "03307 04303 08203 12314 100"
220 DATA "DOG SNAIL FOX HORSE ZEBRA"
230 DATA "02302 06311 10413 11412 100"
240 DIM QS(25), Q1(25), Q2(25)
250 DIM P(25), Q(25), PJ(25), JK(25)
260 FOR I=1 TO 5: READ Z1$, Z2$
270 FOR J=1 TO 5: K=I*5+J-5
280 QS(K)=MID$(Z1$, JK$-5, 5)
290 Q1(K)=VAL(MID$(Z2$, JK$-3, 1))
300 Q2(K)=VAL(MID$(Z2$, JK$-2, 2))
310 NEXT J, I: CLS: PLAY "T32L4"
320 I=1: KP=1: KQ=1: JP=1: JQ=1
330 '--CK AVAILABLE-----
340 JK(KP)=JQ: IF P(KQ)>>0 THEN 530
350 '--CK CONFLICT
360 PRINT@I*32+JP*6-4, QS(KQ$)
370 X1=Q1(KQ): X2=Q2(KQ)
380 IF X1>2 THEN X3=PJK(X2)
390 ON X1 GOTO 640, 400, 420, 440, 470
400 '--CK JP=CONSTANT
410 IF JP=X2 THEN 640 ELSE 500
420 '--CK JP=PJK, .
430 IF JP=X3 THEN 640 ELSE 500
440 '--CK JP=PJK, .+1
450 IF JP=X3-1 THEN 640
460 IF JP=X3+1 THEN 640 ELSE 500
470 '--CK JP=PJK, .+1
480 IF X3=0 THEN 500
490 IF JP=X3+1 THEN 640
500 '--CONFLICT, NEXT Q-QUALITY
510 PLAY "03E" '--MID NOTE
520 NN=NN+1: PRINT@289, NN
530 KQ=KQ+1: JQ=JQ+1
540 IF JQ<6 THEN 330
550 '--GO BACKWARD-----
560 PLAY "02C" '--LOW NOTE
570 PRINT@I*32+JP*6-4, " "
580 PRINT@I*6+JP+219, " "
590 IF KP>1 THEN 610
600 PRINT@320, "NO MORE SOLUTIONS": STOP
610 JP=JP-1: IF JP<1 THEN JP=5: I=I-1
620 KP=KP-1: P(Q(KP))=0: Q(KP)=0
630 JQ=Q(KP): KQ=I*5+JQ-5: GOTO 530
640 '--GO FORWARD-----
650 PLAY "04G" '--HIGH NOTE
660 PRINT@I*6+JP+219, USING "#", JQ,
670 IF KP=25 THEN 720
680 P(KQ)=KP: PJK(KQ)=JP: Q(KP)=KQ
690 KP=KP+1: JP=JP+1
700 IF JP>5 THEN JP=1: I=I+1
710 JQ=0: KQ=I*5-5: GOTO 330
720 '--SOLUTION!
730 PRINT@320, "SOLUTION!, HIT ENTER"
740 PLAY "T8L403CFAL4.04CP8L403AL2.04CT32L4"
750 INPUT Z$: PRINT@320, " ", GOTO 500
```

Contributing editors Patrick and Leah O'Connor reside in Chicago, IL. Patrick has held the position of professor of digital electronics at DeVry Institute of Technology for 14 years. Leah does freelance computer programming and technical writing for a number of Chicago-area companies, including the Image Producers in Northbrook.

Alpha Micro AM-1000

Continued from page 74

small muffin-style fan exhausts warm air extracted from the circuitry inside.

The rear panel also contains all of the system's I/O connectors. Some of them are sure to appear strange—even to those familiar with other computers. Three ordinary 25-pin RS-232 jacks connect to terminals and printers conforming to this common serial interface. Data transmission rates from 50 to 19.2K baud are supported. The fastest rate is equivalent to 1,920 characters per second; this will fill up an ordinary 24 by 80 display screen in 1 second. The remaining large connector on the rear panel taps into a 50-pin SASI bus. This plug allows the connection of external disk drives for additional mass storage capacity.

The three remaining rear-panel connectors are all coaxial video jacks, components one would not expect to find on a business microcomputer. The VIDEO IN and VIDEO OUT pair is intended for connection to the dubbing jacks on a video cassette recorder (VCR). The two connectors support this computer's unique ability to make copies of disk data onto an entertainment-quality VCR. Alpha Micro engineers are mysteriously silent about the third jack, labeled VIDEO I/O. Nothing in the machine currently utilizes this part; it obviously represents something for the future. Our guess: a tie-in to a local area network consisting of other AM-1000s; perhaps larger computers.

With the top panel removed, the AM-1000 reveals that the majority of its electronic circuitry is contained on a single, large circuit board. Made with four layers of etched circuitry, the 12-in. by 15-in. card contains the MC68000 microprocessor integrated circuit along with its supporting circuitry. The 68000 chip itself is easy to spot: it's one of the largest ICs in current production. Its 64-pin package conceals 16 32-bit internal registers and a cycle speed of 8.0 MHz. Communications between the processor and outside circuits are performed via a 16-bit wide data path. The progress made by microcomputer engineers is evident in the fact that the 68000 performed our benchmarks nearly five times quicker than the 16-bit WD-16 utilized in Alpha Micro's first AM-100 computer.

The main circuit board also contains 4K bytes of ROM and 128K bytes of RAM. These can be expanded to 16K bytes of ROM and a half-Megabyte of RAM. The operating system takes up a minimum of 24K bytes of RAM, leaving roughly 104K bytes to be split between the users. This is typically 4K bytes for the printer and 50K bytes for each of two terminals. This computer is the first we've seen up close to make use of the newly-available 64K-bit dynamic RAM integrated circuit chips. It's amazing how little physical space the memory occupies when each tiny chip holds 8192 bytes of data. We can

easily remember the days when it took two entire S-100 cards to corral this many characters.

Each byte of memory is equipped with a ninth parity bit, used to check for data errors. A parity check is performed on each of the millions of memory-read activities occurring each second. When an anomaly is discovered, the front-panel PARITY ERROR lamp lights, and the applications program stops with a "memory error" warning. The extremely high density of modern RAM chips makes them more susceptible than ever to random errors caused by alpha particle strikes (cosmic rays being one of the more unstoppable sources). It's becoming increasingly important for a computer to have some graceful method of handling such incidents.

The main circuit board also contains the three RS-232 I/O circuits, as well as a real-time clock/calendar. The latter circuit is much like that contained in a digital wristwatch; there's even a tiny battery to keep the time setting during extended periods of power outage.

Near the 68000 is an unfilled socket with a fascinating future: it's reserved for a "security" chip. As yet undesigned, this device is intended to provide a hardware-enforced unique serial number for each AM-1000. Proprietary software products can be configured to interrogate the security chip and refuse to run (or perhaps, revert to a reduced-capability demonstration mode) if the machine serial number does not match the one built into the program. It's a way to allow the computer user to make unlimited backup copies of purchased software, while at the same time controlling the proliferation of pirated copies of those high-cost programs.

Disk storage options

Two interfaces are provided for disk storage. If the floppy diskette option is selected, the appropriate controller circuitry is included on the main circuit board. If a Winchester hard disk drive is selected, the controlling electronics for the SASI bus are included. (SASI stands for Shugart Associates Standard Interface, an interface method developed by a dominant supplier of disk drives to the microcomputer industry.) This bus is showing up in more and more micros of late—a trend towards standardization that cannot help but be beneficial for the consumer.

Fully one-third of the components on the main circuit board are dedicated to the VCR interface. So much real estate is needed because dense, single-purpose chips have not been developed for this novel function. The power represented by just one of the many chips (a dedicated 4MHz Z80A) attests to the complexity of the task of video recording. The VCR circuitry, also available on an S-100 board, is designed to interface with the NTSC composite video jacks contained on most home video recorders. Data can be transferred between

the computer's disks and a VCR at a rate of 1.0M byte per second. On a Winchester-only system, it's possible to boot up the computer utilizing only a video cassette tape.

Because of the relative unreliability of consumer-grade video tapes, each 512-byte block of data is recorded along with a 16-bit CRC check word for confirmation at playback time. In fact, each block

It gives the best rationalization...for a business to write off... entertainment gear.

of data is recorded at least six times, sometimes more. At playback time, any block with an erroneous CRC is discarded and the next one on the tape is read. This continues until an error-free block of 512 bytes is sensed, or there are no more spare copies of that particular block. The primitive control of a VCR's tape position precludes any plan of backing up for a retry.

If the technique is lacking in elegance, it ranks high in terms of pragmatic reality. The end result is that an under-\$1,000 VCR will reliably record up to 80M bytes of data on a single \$20 2-hour tape cassette. Those are prices that can't be touched with "real" computer equipment. The technique works with any of the popular cassette formats, but Alpha Micro has standardized on the VHS format to promote interchangeability among users.

In actual use, we found the VCR to be a slightly awkward method for storing computer data. The tapes are slower and harder to handle than streamer cartridges, and there's always the possibility that a family member will record a *Dallas* episode over your last backup. On the plus side, it's possible to tap an external video monitor or TV set into the playback line, giving visual confirmation that the data is being transferred. Given the mass production capacity of the consumer video industry, the price of the magnetic tape equipment or media can't be beat. Besides, it gives the best rationalization we've seen for a business to write off the purchase of entertainment gear.

The remainder of the computer's interior is filled with a high-efficiency switching power supply and the disk drives, along with supporting circuit cards. The primary disk storage device is a 10M-byte Winchester-technology unit supplied by Shugart. It's a four-head device utilizing a pair of 5½-in. platters. Average access time for any given piece

of data is 99 mS. This is about three times slower than the very best (and very expensive) cartridge disk drives available with other computers. The relatively slow speed is part of the price one pays for small physical size and low cost. This disk drive seems an appropriate choice for the AM-1000, which is limited by its I/O circuitry to three simultaneous users, plus any background tasks that happen to be running. It's the many-user multiprocessing applications that really test the access speed of a disk drive.

The 5½-in. minifloppy diskette drives show up here in their first-time-ever application in an Alpha Micro computer. There is room for one such drive if the 10M-byte hard disk option is selected; two floppies may be fitted if they are the only ones in the box. Each drive is configured as a double-density, double-sided device giving 819K bytes of data per diskette. The drives are supplied either by Seagate or by Tandon.

Ask an Alpha Micro owner to disclose the best feature of his computer, and the answer is likely to be the operating system software. The Alpha Micro Operating System (AMOS) was designed over five years ago in the pattern of timesharing mainframe and minicomputer systems. If you've spent any time with DEC-10 operating system (popular in many universities on Digital Equipment Corp.'s PDP-10 timesharing systems), you will feel right at home with the very similar AMOS. The software manages the physical disk space with flexible boundaries that keep the various users out of each other's areas with a scheme of project and programmer numbers. Various public-user library areas are maintained in a manner that most first-time users find mildly bewildering.

Important tasks first

The timesharing scheduler rotates the processor's attention between the various users with a claimed overhead of less than 1%. Each user may be assigned one of 64,000 priority levels, so you can stack the deck in favor of the most important tasks. A big-system printer spooler is provided to manage the printing activity. Background tasks can be submitted via a language reminiscent of IBM's Job Control Language (JCL). Jobs can be scheduled to begin at a given time of the day, and will run without needing a terminal dedicated to them. One of the more interesting applications for JCL is to schedule an unattended midnight backup of the disk data onto video tape. The VCR control can be set to begin recording late at night, just as it would to capture *The Johnny Carson Show*.

AMOS is a disk-based operating system. That is, most of the keyboard commands cause a search on the disk for a program that is loaded, then executed. Such programs can range all the way

from the simple DIR (much like the CP/M command of the same name) to more complex applications like the Basic language or word processor. Most of these programs (there are something over 200 of them) can be loaded just once into memory at bootup time. The commands can then be accessed almost instantly without waiting for the disk drive to load them. Most of the programs are reentrant, meaning that only one copy of the program needs to be in memory, no matter how many operators are using it at the same time.

AMOS includes three programming languages (Basic, Pascal and Lisp), along with a very friendly text editor called AlphaVUE. The lengthy list of included utilities is clearly intended to endear the hearts of application programmers: machine-language sorting and binary search routines, Indexed-Sequential Access Method (ISAM) support, and a command language which is an extension of CP/M's SUBMIT facility. Physical hardware devices are defined via a modular software driver scheme —making the system easily adaptable to future peripheral products.

Historically, most business applications programs for Alpha Micros have been written in AlphaBasic. This is a semi-compiled language with most of CBasic's structured features. Program variables can be usefully long, and GOTO statements can specify wordy labels as well as line numbers. There's a Cobol-style "level" method for defining variables that fits well with Alpha's disk file structure. Most Basic programming is done with the screen-oriented text editor that is actually a part of the word processing package.

We have run our Prime Number Cruncher (IA Aug 81) on all available versions of Alpha Micro computers; the AM-1000 is clearly the fastest. The processing time of 119 seconds for this 8.0 MHz computer makes it 2.7 times faster than the 3.0 MHz AM-100/T; 4.7 times faster than the 2.0 MHz AM-100. All are nominally 16-bit processors, but there's a significant difference. The new machine is saddled with performing floating point conversions via software routines, whereas the earlier equipment

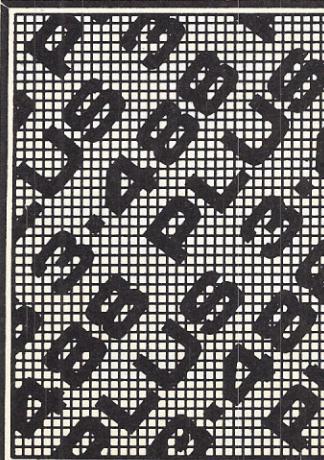
has the advantage of a hardware floating-point converter chip.

As nice as it is, the operating system almost seems oversized for the AM-1000. Its ability to handle more than two dozen simultaneous users, for example, is wasted on this desktop unit. The gigantic software limits to memory addressing and data file sizes far exceed the ability to plug additional hardware modules into this machine. In response to this, the Alpha architects state that much of their success in the past has been a strict limitation to a single operating system, runnable across the complete range of their products. Commonality of software is critically important, they believe, in allowing the user to upgrade to larger systems as their needs grow. The argument makes a lot of sense.

Comprehensive accounting applications

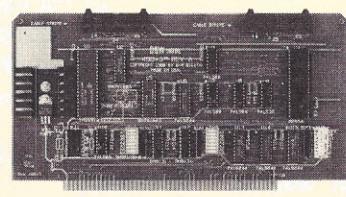
In the area of applications software, this manufacturer offers a set of five business packages collectively called AlphaAccounting. Included are general ledger, accounts receivable, accounts payable, payroll and order entry/inventory control. The modules will operate independently, or can integrate together in various combinations if needed. AlphaAccounting is written in Basic, and the source code is routinely supplied to authorized Alpha Micro dealers to enable local customizing. The business software began life as a minicomputer-resident DIBOL package created by the highly-regarded Montrose, CA firm Mini-Computer Business Applications (MCBA).

Beyond this, applications software is available from a rather informal community of software houses that have sprung up around the world in support of the 7,000+ local Alpha Micro installations. AMOS doesn't compare with CP/M in its universal appeal, but it still seems to support a significant collection of already-programmed applications. Software prices, however, are notably higher than similar CP/M products. This is due to the disparity in the number of installed systems.



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Several independent database management programs are available, as well as a handful of word processors, applications generators and spreadsheet calculators. There is also a surprisingly complete collection of languages: APL, C, Cobol, Forth, Fortran, and a pure compiling Basic nearly triple the speed of Alpha Micro's own version. Be

There is a surprisingly complete collection of languages...

warned, however: these independent offerings were developed for earlier Alpha Micro equipment, and require conversion before they will run on the AM-1000.

The AM 1000-07, which includes 128K bytes of memory, a 10M-byte hard disk drive and a VCR interface, retails for \$7,995.

The AM 1000-03 unit, with a single 819K-byte mini-floppy diskette drive, is offered at a lower price.

Price of the top-of-the-line AM 1000-09 version, with floppy disk, 10M-byte hard disk and the VCR interface was not available at press time.

The prices include word processor, languages and other utilities described above, with the exception of the Alpha Accounting applications software. Peripherals, such as terminals, a printer and a video cassette recorder are not included, and must be added by your local dealer. A terminal will cost from \$650 to \$1,500; a printer, from \$450 to \$3,300, depending upon requirements for speed and print quality. You can pick up a VCR at your local video store for prices ranging from \$600 to \$1,500. □

Technical Editor Tom Fox has authored over 50 articles and editorials for IA since May 1979. He has spent his entire 21-year career in the field of electronics with the last 14 years devoted to computer systems and their application to business and industry. He is President of FoxWare Systems Corp. (Irvine, CA), a firm specializing in the integration of microcomputers and applications software for small business users.

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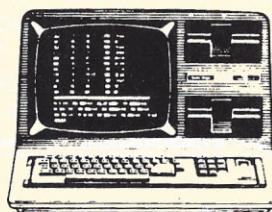
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INTERFACE AGE 151

Business Systems Comparison

Continued from page 92

purchased with the 6M-byte Winchester or with a 10M-byte Winchester and 1M-byte 5½-in. floppy in the same chassis. Also offered is the Datavue 132-C video terminal which allows viewing the full 132 columns on an 11¾-in. screen. The company even offers a special version of Microsoft's Multiplan financial modeling program that allows 132-column spreadsheet displays.

Dilog Business Systems

The CRT, keyboard and disks are integrated into these desktop computers. Each is based on the Z80 processor supported by the CP/M operating system. The 1000 integrates two disk drives, whereas the 1500 incorporates a 5M-byte Winchester disk in place of one of the floppies. These systems and the workstation terminal can all be tied into the multistation network offered by the company.

Durango Systems

The 800 series is based on the 5MHz version of the 8085 and includes almost 2M bytes of disk storage. The system is integrated with a 9-in. CRT, but up to five users can be connected to the system. The price includes a 165 cps printer and the single-user CP/M operating system. A proprietary multi-user operating system, DX-85M, is also available.

Dynabyte

These mid-priced computers come in a variety of models all based on the S-100 bus. The model 5505 (IA Apr 82) includes a 5.3M-byte Winchester and a 5½-in. diskette. Lower priced models are available in the same size package without the Winchester. For those contemplating multi-user applications, this is an ideal system, since any of the models in the series support up to 8 terminals; several jobs can be run simultaneously through OASIS or an MP/M-compatible operating system.

Eagle Computers

In addition to the Z80 based systems, Eagle offers an 8086-based small business computer. The company (formerly AVL) integrates the CRT, diskettes and keyboard into a modular desk-top unit. Like the Eagle II (IA Jun 82), the systems offer menu-driven software to ease the burden of operating an unfamiliar system. This is particularly helpful to the first-time computer user.

The Spellbinder word processor and Accounting Plus programs, integrating eight modules, are included with the systems, providing a very cost-effective business tool. Other models offer expanded disk capacity so you can tailor the system to your needs.

Fortune Systems

The 32:16 derives its name from the 68000 microprocessor that allows the operational capability of this high-performance system. The CRT sits in a swivel base that rests atop the electronics package housing the dual disk drives. The operating system is based on UNIX and provides multi-user time-sharing capability or single user operation as a starter system.

The full function keyboard sports 16 special function keys but otherwise is similar to the Wang Laboratories word processing keyboard. The internal memory includes parity checking but an optional ECC (error checking and correcting) feature can be added. The comprehensive array of software packages, including the database management system IDOL, are available from the company.

Gimix

The company's system incorporates the S-50 bus and allows additional cards to be plugged into the system to expand the system capacity. Each system is based on the 6809 and the large selection of add-on boards allow expanded capacity. The system price includes a UNIX-like multi-user multi-tasking operating system, known as OS-9, licensed from Microware Systems Corp. The system can also select, under software control, the FLEX operating system for single-user software development.

Gnat Computers

Recently re-locating from San Diego to San Leandro, CA, this company offers a compact computer—integrating terminal and disk into a single unit. A convenient feature not available on any of the other systems is the programmable keyboard, with overlays, supporting a number of popular applications packages, such as Wordstar, Supercalc, Wordmaster and others. The keyboard overlay makes it easy to use these programs, particularly when used infrequently. This is also helpful in training new users in operating the variety of software packages available.

Hewlett-Packard

Many personal computers offered by H-P in the past have catered to the engineer whereas the larger systems (such as the HP-1000) have been used in the data processing environment for a number of years. With the introduction of the HP-125 (IA Dec 81), HP attracted the interest of the business computer user by offering an attractively packaged CP/M-based system. With CP/M, the user can install just about any application program he desires, but the large selection of business software is supported by the softkeys.

IBC/Integrated Business Computer

All Cadet models offer the high speed 6MHz Z80B processor, which allows any program to run 50%

faster than most of the other Z80A-based systems. The Cadet-20 integrates a 20M-byte disk in a tabletop unit that supports up to 10 workstations or printers in any combination. These systems incorporate the Mitsubishi disk drives for both the hard and floppy disks, providing higher speed access than most other disk drive systems.

IBM

Over a year old, the IBM Personal Computer (IA Feb 82) probably provides the best of both the 8- and 16-bit worlds with the 8088's 16-bit architecture plus the 8-bit compatibility of some existing software. This computer is already becoming a frequent choice of the business user. The slim expansion support from IBM is enhanced by a number of independent suppliers, providing not only additional memory but also a Winchester disk drive. CP/M compatibility is even available from a third party. With the rapid development of software support for the IBM unit, it should easily support most small business applications.

IMS Int'l

These systems are all based on the S-100 bus and can therefore easily be expanded to meet the needs of just about any business application. The company will supply the system as required or any one of the systems can be field-upgraded at the dealer's location. All IMS hardware comes with a two-year warranty, and an optional warranty can be purchased for the peripherals.

Intelligent Systems

Hardly new to the small computer business, this company still utilizes the 8080 at the heart of each of its systems. The company (originally known as ISC) provides a family of colorgraphic, intelligent terminals. Each terminal can operate independently or as a peripheral of any computer system. The 8364 integrates a 13-in. color terminal and provides a display area of 80 columns by 48 lines; and a light pen option can even be added. The 8064 has similar capability, but is provided in an industrial cabinet with a 19-in. color monitor. The company has recently reduced prices on both of these units.

The 3651 also provides a 13-in. color monitor but with a 64-by-32 display configuration and its own operating system, known as The File Control System (FCS).

Intertec Data Systems

The Superbrain has been around for three years and can be used either as a stand-alone computer or a very intelligent terminal. Compustar, released last year, can be integrated into a multi-user terminal system with up to 255 workstations per network.

An optional 10M-byte Winchester (\$49.95) can be attached to any of the systems.

For those concerned with end-user support, the company offers extended warranty, a shared service program or on-site maintenance through the country.

Logical Business Machines

This company offers several small business computers from the low end David to a high-end Goliath, which can support up to 20 users. In addition to an optional Winchester disk, a removable hard disk is also available.

All of the systems operate with a natural programming language, allowing the user to understand and apply software that can be customized to an individual application. The English instructional language requires significantly fewer instructions and typically shorter programs than conventional programming languages.

Micro Five

The Microstar I fits nicely into our \$10,000 package figure; at that it gives starting point for more powerful systems. The STARDOS operating system includes an extended Business Basic that should support most applications, and CP/M is also available.

North Star Computers

An old-timer and strong promoter of the S-100 bus, North Star offers a family of computer systems ideal for business. In the same integrated package, you can incorporate two 5 1/4-in. floppies or one floppy and a 5M-byte Winchester disk. The company not only offers its own operating system, but also a very popular Basic.

Onyx Systems

The Sundance/132 is an integrated unit supporting a terminal and a Winchester disk along with a 12M-byte tape backup, a feature not offered by many other systems. The company has also introduced the Sundance-II with 256K bytes of RAM and allowing up to three users in a compact, attractive unit. It supports both ANSI and VT52 modes of operation with a variety of user programmable options. Both units include full capability of both hardware and software, with an extended range of almost 50 utilities added to the standard CP/M operating system.

Osborne

The Osborne 1 has lived up to its initial claims by offering a portable unit plus the application software for one of the most reasonable prices in the industry. In addition to gaining popularity with the businessman (IA Nov 81), it has also been used in (and subsequently banned from) the Harvard Law School classroom to support preparation of final exams.

With all of the software support and the other capabilities of this system, it may even make sense

to own two computers: the Osborne 1 and a separate business computer. Use the portability of the Osborne to do work where you please, then take the disks to your other computer. If the portability doesn't sell this computer, the price certainly should.

Polymorphic Systems

This seven-year old company configures each system around the S-100 bus. The systems are expandable by plugging in additional boards or adding additional disk capacity in the form of floppies or hard disks. The company's EXEC operating system is standard, but CP/M is also available.

Radio Shack

Since the initial success of the model I five years ago, Radio Shack has been improving products and enriching the TRS software library. The model III (IA Feb 82) is essentially an integrated model I and, just like its predecessor, has been accepted as a very popular computer. The model II (IA Sep 81), on the other hand, has been targeted more at business applications and has an assortment of software to benefit all types of operations. To make it even more attractive, the price has recently been reduced by \$400.

The latest offering from this company takes a major step in improving the power of the business computer. The model 16 picks up where the model II leaves off and can even run all of its software. The model 16 is packaged in the same cabinet as the model II but incorporates dual processors (Z80A and 68000) plus two disk drives in the same desk-top unit. Of course, it can be expanded just as easily and even provides the ability to support two users with an external terminal.

Sanyo

Recently introduced to the U.S., these desktop computers offer an integrated design including 12-in. CRT and a pair of 5-in. floppies (MBC-2000) or a pair of 8-in. floppies (MBC-3000). Both are controlled by a pair of 8085A microprocessors, one of which is dedicated to I/O processing. Like many other companies, Sanyo has wisely chosen CP/M as the standard operating system and a Microsoft-equivalent Basic is included with the system.

SD Systems

A wide range of choices is available supporting from one to five users. While the single-user WS800 provides no expansion capability it can be purchased with up to 2M bytes of floppy disk. The SD200 incorporates two 8-in. double-sided double-density disks or it can be purchased with a 10M-byte Winchester in place of one of the floppies. A 14M-byte streamer is available for back-up purposes. The company even offers a 96M-byte removable hard disk for those requiring a large amount of

off-line storage. CP/M is offered for the single user systems, but OASIS and MP/M are also available.

Seattle Computer

With the 8086, this low-cost system will operate five times faster than most Z80 systems but offers the same expansion capability through the S-100 bus. A diskette controller is built in, but the drives are optional and can be purchased from the company or alternate sources.

Even without the disks, MS-DOS is included with the system. This is the same operating system available for the IBM Personal Computer and, in fact, was developed by Seattle for IBM.

Smoke Signal Broadcasting

These systems, although priced slightly higher than our \$10,000 figure, include not only an external terminal but also a printer. This price probably best illustrates the cost of a complete business computer system since both peripherals are almost always required. The Soroc IQ-120 terminal and the Anadex DP-9500 printer are included in the system cost, but other peripherals can be ordered.

Based on Motorola's 6809, the Chieftain product line is offered with the standard DOS69D UNIX-like operating system plus the 6809 assembler. Both a Basic interpreter and compiler are available, along with other programming languages. Up to eight floppies and four Winchester drives in any configuration can be added to a system, providing capacities well beyond most small business requirements.

Systems Group

The company's S-100 based products (IA Oct 81) will support a comprehensive array of small business applications, particularly with the capability of supporting up to 12 users. Both MP/M and OASIS are offered in the multi-user environment, but CP/M is available for the single user. One of the latest introductions from the company is a software package called Business Express, which is somewhat of a mix between a high-level language and a database management system. It is closely linked with the company's hardware, and therefore has taken advantage of some unique features built into the system. Business Express should prove beneficial to both the first-time user and systems houses.

TEI

The latest offering from this company is a scaled-down version of the System/48 (IA Aug 81). The hardware has been re-configured to incorporate the 6MHz Z80B and 128K bytes of memory with parity. Although CP/M compatible, the company's Magic operating system is integral to the usefulness of the hardware, and is therefore included in the base price. Also included and just as useful is the database management system with capabilities usually found only in software packages costing

\$500 to \$1,000. The price of the unit is particularly attractive when you consider that it also includes a 5M-byte (formatted) Winchester disk drive.

Televideo

Well known for an array of intelligent terminals, this company offers the business user an alternative to multiple suppliers. Integrated into the terminals are the disk drives to allow standalone operation, but a network configuration is available for the multiple user office. With this approach, you can start out with the minimum system and be assured that it can be expanded when required.

Texas Instruments

The Business System 200 line of systems has expanded the low end of TI's DS990 family of compatible computers. Introduced less than a year ago, the company offers the compact single user systems in a variety of disk storage capacities. The DX10 micro-operating system supports the Cobol language for a variety of business applications. In addition, the Business System 200 supports the UCSD-p system, which lets you run application programs developed for the UCSD-p system environment. Other systems such as Basic are becoming available from third-party software houses and will therefore greatly expand the software application base available.

TRW-Fujitsu

Being the first in a family of information system products, the Affinity-16 operates in a standalone situation, but also can be grouped with other systems in a multiprocessor environment. The 12-in. CRT is integrated with a pair of floppies and a full ASCII keyboard, including 12 special function keys.

Offered with the system are two types of Basics—business and scientific versions—both featuring sophisticated error-handling functions. An interactive screen format generator lets you create and manipulate screen layouts, eliminating the need to encode the input and output formats in Basic programs.

Tricomp Systems

These high-performance systems incorporate the seldom-seen Z8001, operating on a high speed bus. Additional multi-user performance is enhanced with a hardware memory management unit. The system 1 consists of a single board, whereas the system 5 incorporates a card cage and allows the memory to be expanded in increments of 512K bytes. Included with either system is the XENIX multi-user operating system.

Vector Graphic

The company's S-100 based computer systems utilize the 6MHz Z80B microprocessor, providing a 50% increase in speed over most other systems. The

2600 is an integrated information system, consisting of the video console and an attractive desk top module housing disk drives. The 3005 is similar, but incorporates a Winchester hard disk.

Both systems incorporate CP/M as a standard operating system, along with Microsoft Basic, and Scope, a word processor-like editor for CP/M programmers using any language. The company also offers multi-user capability with a higher performance 5032 integrated information system.

Wang

One of the premier companies in office automation, Wang produces a variety of business computers, word processors and general information management systems. The Wangwriter exhibits the company's commitment to office automation by providing not only a standalone, easy-to-use word processing system, but also a system that can be utilized as an interactive terminal on the 2200 mini-computer product line (IA Apr 82).

The low-cost system integrates a movable display screen, keyboard, one or two mini-floppies and a printer. Besides the powerful word processing software supported by almost 24 special function keys, the system also supports the CP/M operating system. In this way, the Wangwriter can perform a wide variety of applications in addition to word processing, thereby become the initial computer for a growing office.

Zendex

Starting out just three years ago as a supplier of Multibus boards, this company has incorporated some of its boards into complete computer systems. All systems are based on the Multibus; the model 925 uses a 9-slot chassis so that the system can be expanded and configured as the user requires. It can support up to five users with the optional MP/M. The model 238 incorporates the Intel 8088 and comes standard with CP/M 86.

Zenith Data Systems

These low cost systems offer an integrated user station and include CP/M as a part of the system cost. Also included in the standard system are the Basic language and the Supercalc spreadsheet program. Naturally, all other CP/M based products will operate on these systems. Compatible systems in kit form are offered by Heath Company, a division of Zenith.□

Technical editor Terry Benson has provided numerous articles for IA, almost since its inception. For almost five years, he provided technical assistance to many Intel Corp. customers throughout the Western U.S. as a field application engineer. Since leaving Intel, he has been working as an independent consultant supporting a wide range of microcomputer applications.

Let Your Computer Debug Its Own Program

Continued from page 43

Important variables used in Proofer

A\$ Stores each program line as it is input from disk.
 A ASCII value of first character in TEST\$.
 BAD\$(n) Array which stores bad words and variables found.
 CU Counter, number of words displayed to screen.
 D\$ Temporary storage for Keyword dictionary data.
 D2 Alphabet position of first character in D\$.
 DOSFLAG Set to zero if user operating NEWDOS 80 2.0.
 F\$ Name of target program to be proofed.
 FLAG Flag, set to one when TEST\$ equals dictionary entry.
 I\$ Inkey\$
 L Length of program line, less line number.
 LP Number of left parentheses found in program line.
 M\$ Individual character in program line currently being examined.
 N,Ni-N4 Loop counters.
 NI Counter, number of lines with parentheses error.
 NU Counter, number of lines with bad words, or variable.
 P\$ Type of parenthesis missing, "left" or "right".
 P Position of first space in program line.
 PAR\$(n) Array storing program lines missing parenthesis.
 PFLAG Flag, set to one if printer output desired.
 PREV Alphabet position of previous data element READ.
 RP Number of right parentheses found.
 SEG\$ Program line, less line number.
 SFLAG Set to one when first quote found.
 TEST\$ Portion of program line being checked against dictionary.
 WRD\$(row,col) Array storing keyword dictionary.

Program listing

```

10 CLEAR 8000
20 DIM WRD$(26,16),PAR$(30),BAD$(200)

30 ' ***** Read Keywords into Array *****
40 : FOR N=1 TO 112
50 :   READ D$
60 :   D2=ASC(LEFT$(D$,1))-64
70 :   IF D2<>PREVIOUS THEN PREVIOUS=D2:D=1
80 :   WRD$(D2,D)=D$
90 :   D=D+1
100 :  NEXT N

110 ' ***** Keyword Data Lines *****
120 DATA ABS,AND,ASC,ATN,BASIC,BOOT
130 DATA CDBL,CHR$,CINT,CHAIN,CLEAR,CLOSE,CLOCK,CLS,CMD,COS,COPY,CSNG,CVD,CVI,CVS,DEFFN,DATA,DAT
E,DIR,DEFDBL,DEFINT,DEFSNG,DEFSTR,DIM
140 DATA ELSE,END,EOP,ERL,ERR,ERROR,EXP,FIELD,FOR,FORMAT,FN,FRE$,FREE,FIX,GOTO,GOSUB,GET
150 DATA IF,INP,INPUT,INKEY$,INSTR,INT,KILL,LET,LPRINT,LINEINPUT,LSET,LOAD,LEN,LEFT$
160 DATA LOG,MEM,MID$,MEM,MERGE,MKD$,MKIS,MKS$
170 DATA NEW,NEXT,NOT,ON,OR,OPEN,OUT,PEEK,PRINT,POINT,PONE,POS,PUT
180 DATA RANDOM,RIGHT$,READ,REH,RESET,RESTORE,RESUME,RETURN,RND,RUN
190 DATA SAVE,SET,SGN,SIN,SQR,STEP,STOP,STR$,STRING$
200 DATA TAB,TAN,THEN,TIME$,TO,TROFF,TRON,USING,USR,VAL,VARPTR

210 ' ***** Open Desired ASCII File *****
220 CLS:PRINT:PRINT

```

```

OR M$=>" OR M$="&" OR M$="/" OR M$="*" OR M$=CHR$(10)
OR M$="" GOTO 520
TEST$=TEST$+M$
510 : GOTO 690
520 : IF SFLAG=1 THEN SFLAG=0:TEST$="" :GOTO 690
530 : IF M$=CHR$(34) THEN SFLAG=1:IF MID$(SEG$,N1-1,1)=CHR$(32) THEN TEST$=""
540 : IF M$="" THEN LP=LP+1
550 : IF M$=")" THEN RP=RP+1
560 : FL=0
570 : IF TEST$="" GOTO 690
580 : IF TEST$="REM" OR TEST$="/" GOTO 710
590 : IF VAL(TEST$)>0 THEN TEST$="" :GOTO 690
600 : A=ASC(LEFT$(TEST$+1))
610 : IF A<65 THEN TEST$="" :GOTO 690
620 : A=A+64
630 : FOR N2=1 TO 16
640 :   IF WRD$(A,N2)="" THEN N2=16:GOTO 670
650 :   IF TEST$=WRD$(A,N2) THEN FLAG=1:N2=16:GOTO 670
660 :  NEXT N2
670 : IF FLAG=0 THEN NU=NU+1:BAD$(NU)=TEST$+" : LINE "+LEFT$(A$,P)
680 :  TEST$=""
690 :  NEXT N1
700 : ***** Check Parentheses *****

710 IF RP=LP GOTO 750
720 NI=N1+1:PAR$(NI)="LINE "+LEFT$(A$,P)+" : MISSING "
730 IF RP>LP THEN P$="LEFT" ELSE P$="RIGHT"
740 PAR$(NI)=PAR$(NI)+P$+" PARENTHESIS"
750 RP=0:LP=0
760 GOTO 350

770 CLS:PRINT:PRINT
780 PRINT "DO YOU WANT OUTPUT TO GO TO PRINTER?"
790 I$=INKEY$:IF I$="" GOTO 790
800 IF I$="Y" THEN PFLAG=1
810 GOSUB 1030

820 ' ***** Print out results *****
830 IF DOSFLAG=0 GOSUB 1080
840 : FOR N4=1 TO NU
850 :   IF CU/11=INT(CU/11) GOSUB 1010
860 :   IF BAD$(N4)=BAD$(N4-1) GOTO 900
870 :   PRINT BAD$(N4)
880 :   IF PFLAG=1 THEN LPRINT BAD$(N4)
890 :   CU=CU+1
900 :  NEXT N4
910 GOSUB 1010
920 : FOR N3=1 TO NI
930 :   IF N3/11=INT(N3/11) GOSUB 1010
940 :   PRINT PAR$(N3)
950 :   IF PFLAG=1 LPRINT PAR$(N3)
960 :  NEXT N3
970 PRINT
980 PRINT TAB(20)" -- END OF LIST -- "
990 GOTO 990

1000 ' ***** Page subroutine *****
1010 PRINT:PRINT TAB(20)"HIT ANY KEY TO CONTINUE"
1020 IF INKEY$="" GOTO 1020
1030 CLS:PRINT:PRINT
1040 PRINT TAB(14)" ** POSSIBLE MISPELLINGS AND VARIABLES **"
1050 PRINT
1060 RETURN

1070 ' ***** Use Newdos 80 2.0 Sort *****
1080 CMD "O",NU,BAD$(1)
1090 RETURN

```

```

230 PRINT "THIS PROGRAM WORKS ONLY ON FILES WHICH HAVE"
240 PRINT "BEEN SAVED IN NON-COMPRESSED (ASCII) FORMAT"
250 PRINT
260 PRINT "Are you running Newdos 80 2.0 ?"
270 IF I$=1$ THEN 105FLAG=1
280 IF I$="N" THEN 105FLAG=1
290 LINEINPUTENTER NAME OF PROGRAM TO BE CHECKED :"I$"
300 CLS:PRINT:PRINT
310 PRINT TAB(14):--> Reading in Program Lines --
320 OPEN "I",1,F$
330 OPEN "I",1,F$

340 / ***** Read in one Line of Program *****
350 IF EOF(L1) GOTO 770
360 LINEINPUT#1,I$
370 TEST#1=1
380 PRINT A$
390 F=USP(LAD=0
400 / ***** Strip off Line Number *****
410 F=INSTR(A$,CHR$(32))
420 SEC$=MID$(A$,F+1)
430 L=LEN(SEG$)+1
440 / ***** Loop through all characters in line *****
450 FOR N=1 TO L
460   Ni=HLD$(SEG$,N,1)
470   IF SFLAG<>1 GOTO 490
470   IF Ni=CHR$(34) GOTO 520 ELSE GOTO 690
480   IF Ni="+" OR Ni="-" OR Ni="." OR Ni=CHR$(32) OR Ni="=" OR Ni="(" OR Ni=CHR$(34) OR Ni=")" OR Ni=<" OR Ni=>" OR Ni=>(
490

```

Sample run

THIS PROGRAM WORKS ONLY ON FILES WHICH HAVE
BEEN SAVED IN NON-COMPRESSED (ASCII) FORMAT

Are you running Newdos 80 2.0 ?

ENTER NAME OF PROGRAM TO BE CHECKED: TEST

-- Reading in Program Lines --

```

10 REM THIS IS A TEST PROGRAM
20 / DESIGNED TO DEMONSTRATE
30 / PROGRAM PROOFING CAPABILITIES
40 CLS:PRINT:PRINT
50 A$="1"
60 A=VAL(LEFT$(A$))
70 M$="HELLO":M$+=M$+" THERE"
80 B$=C$+Z$
90 IF D=4 THAN GOTO 80
100 END

```

DO YOU WANT OUTPUT TO GO TO PRINTER ? Y

*** POSSIBLE MISSPELLINGS AND VARIABLES ***

```

A : LINE 60
A$ : LINE 50
A$ : LINE 60
B$ : LINE 80
C$ : LINE 80
D : LINE 90
D$ : LINE 70
PINT : LINE 40
THAN : LINE 90
Z$ : LINE 80

```

HIT ANY KEY TO CONTINUE

*** POSSIBLE MISSPELLINGS AND VARIABLES ***

LINE 60 : MISSING RIGHT PARENTHESIS

-- END OF LIST --

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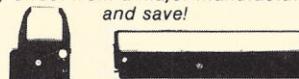
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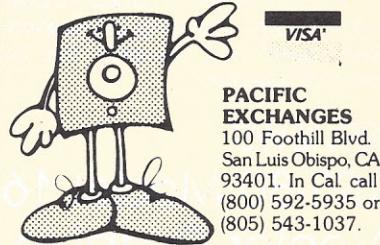
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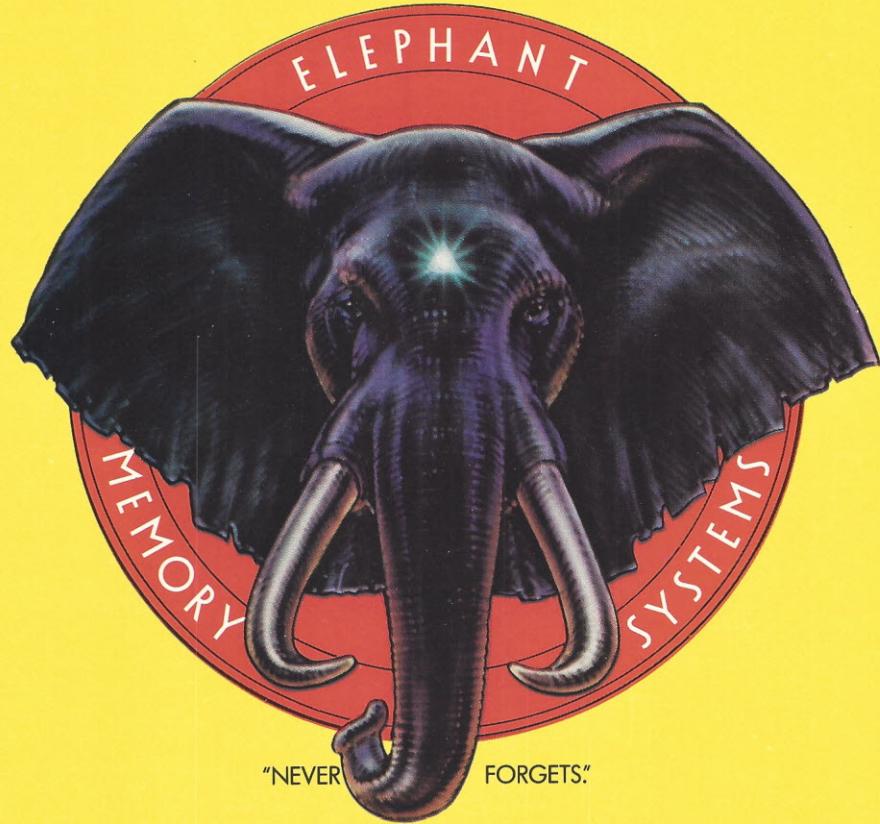
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